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# Delaware Bicycle Facility Master Plan *Report*



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# Delaware Bicycle Facility Master Plan



Report





## 1.0 INTRODUCTION

As part of the Livable Delaware Initiative, the Delaware Department of Transportation (DelDOT) established a Bicycle Policy which states that DelDOT “shall provide appropriate accommodations for bicyclists (on all streets where bicycling is permitted.) This Bicycle Facility Master Plan was developed in order to implement the Bicycle Policy and to provide more specific guidance as to the location and nature of “appropriate accommodations” along DelDOT-maintained roadways.

This guidance has been established by taking into account Delaware’s unique conditions and practices. This Plan does not simply re-iterate the Road Design Manual, the AASHTO Guide or the MUTCD standards but has relied on guidance from several sources, as well as an understanding of DelDOT procedures. The goal was to produce a Plan and design guidelines for improving bicycling conditions on a designated set of DelDOT maintained roadways.

This report documents the plan’s development, recommendations, and implementation strategy.

### 1.1 ROLE OF THE PLAN

The overall **purpose of this plan** is to recognize bicycle facilities as an integral part of the transportation system and provide suitable accommodations for bicycles on the statewide roadway network. Implementation of the plan will achieve the following goals:

- Integrate existing bicycle routes and trails to a larger, statewide bicycle network.
- Establish bicycle routes between municipalities, activity centers, and recreational areas throughout the state.
- Improve local cycling conditions through consideration of bicycle facilities in all DelDOT roadway projects.

The Bicycle Facility Master Plan (Facility Plan) consists of this report and the system map (enclosed with this document.) Combined, these two components serve as a comprehensive approach to improve bicycling conditions in the State of Delaware (see Figure 1.1.) The Bicycle Facility Master Plan works in conjunction with the following policies, programs, and guidelines:

- **Delaware Bicycle Policy.** Approved in December 2000, (Policy Implement # D-06) this policy calls for DelDOT to preserve existing bicycle routes and ensure that future transportation projects do not degrade cycling conditions. The Facility Plan serves to implement this policy, providing DelDOT with specific guidelines on how each roadway under its jurisdiction should be treated; such as, where bicycle lanes should be provided, where bicycle routes have been designated, etc. By making the implementation of the Facility Plan an integral part of roadway construction and maintenance projects, DelDOT will be able to make steady progress towards a more bicycle-friendly transportation system.
- **DelDOT Road Design Manual.** The Road Design Manual provides DelDOT engineers with a detailed set of standards on all roadway design factors and has

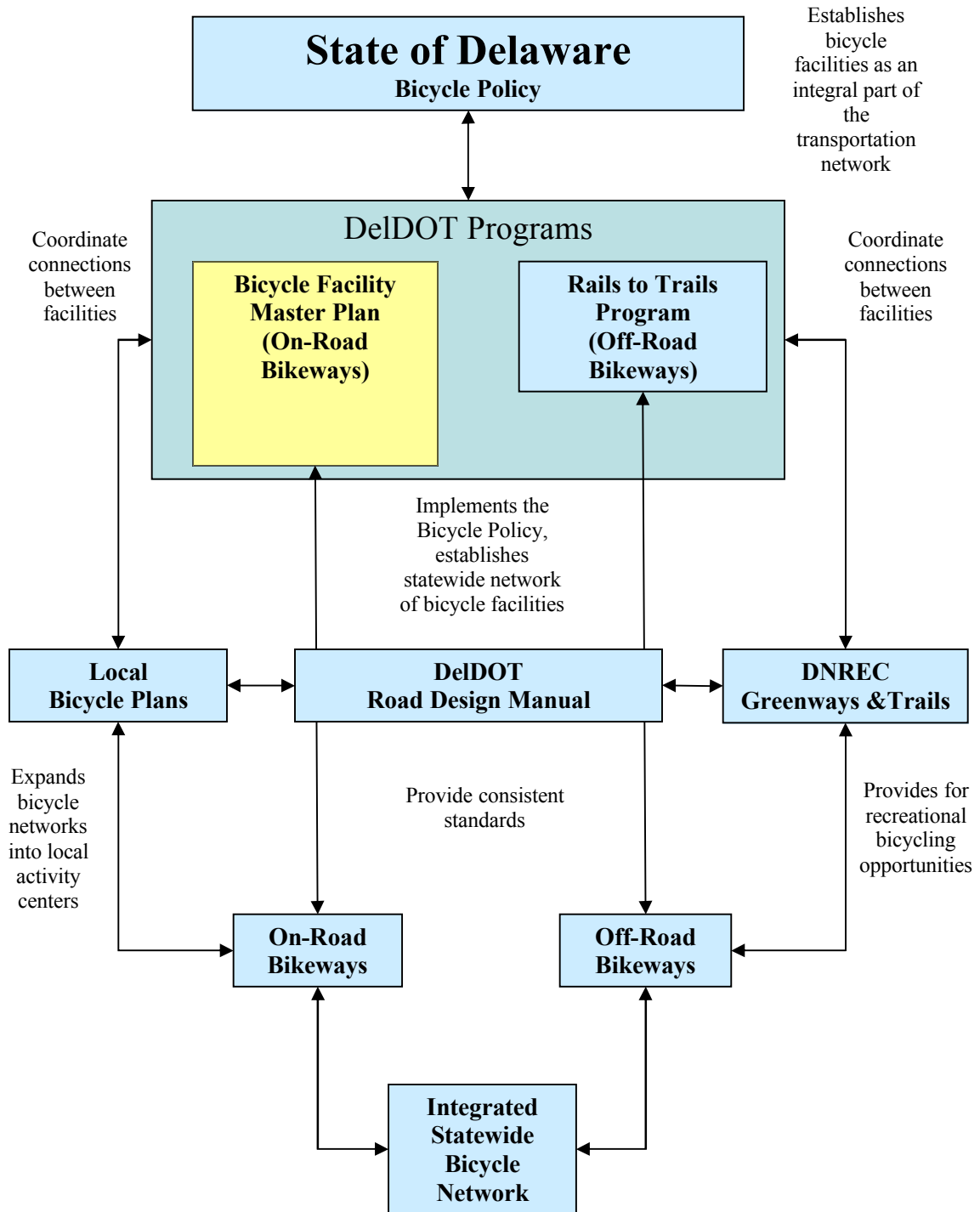
recently been updated to include more guidance on how bicycle facilities should be designed. The routes and facility needs identified in this Facility Plan would be designed in conjunction with the standards in the Road Design Manual.

- **Delaware Rails to Trails Program.** The Rails to Trails program is designed to extend the statewide bicycle network by providing off-road bicycle facilities on former railroad rights-of-way. This program will be coordinated with the Bicycle Facility Master Plan to ensure convenient connections between Rail to Trail facilities and on-street bicycle routes.
- **Delaware Greenway and Trail Program.** The Greenway and Trail Program governs the development of the off-road bicycle and pedestrian facilities maintained by the Department of Natural Resources and Environmental Control (DNREC.) The Bicycle Facility Master Plan will encourage recreational cycling by linking DNREC's greenways and trails to residential areas with on-street bicycle facilities.
- **Local bicycle plans.** Many of the municipalities within Delaware have recognized the benefits of cycling and have made efforts to develop local bicycle networks. The Facility Plan encourages these efforts and has considered linkages between the existing local bicycle routes and the planned statewide bicycle network in the plan development process. Local jurisdictions can refer to the Facility Plan and the Road Design Manual when considering the provision of bicycle facilities.

## 1.2 ELEMENTS OF THE PLAN

The Plan consists of four basic elements:

- **Bicycle facility needs.** This section describes the characteristics of bicyclists and the facilities they may require to feel comfortable using a bicycle as a regular means of transportation. It also identifies some of the most common concerns about on-street bicycle facilities in Delaware.
- **Facility recommendations.** This section explains the hierarchy of bikeways in the statewide bicycle network. It also provides guidance as to how facilities should be developed along each type of bikeway.
- **A map of designated bicycle routes.** A map of the statewide bicycle network is supported by a text description of each of the routes. Major barriers and issues along each of the routes are identified.
- **Plan implementation.** These sections explain how the statewide bicycle plan will be implemented. It also explains the role of DelDOT departments and other agencies in plan implementation. There are also specific sections describing a project prioritization process and a waiver process.



**Figure 1.1. DelDOT's Comprehensive Approach to Establishment of the Bicycle Network**

### 1.3 HOW THE PLAN HAS BEEN DEVELOPED

This plan was developed with input from the general cycling public of Delaware. The plan was assembled using the following process:

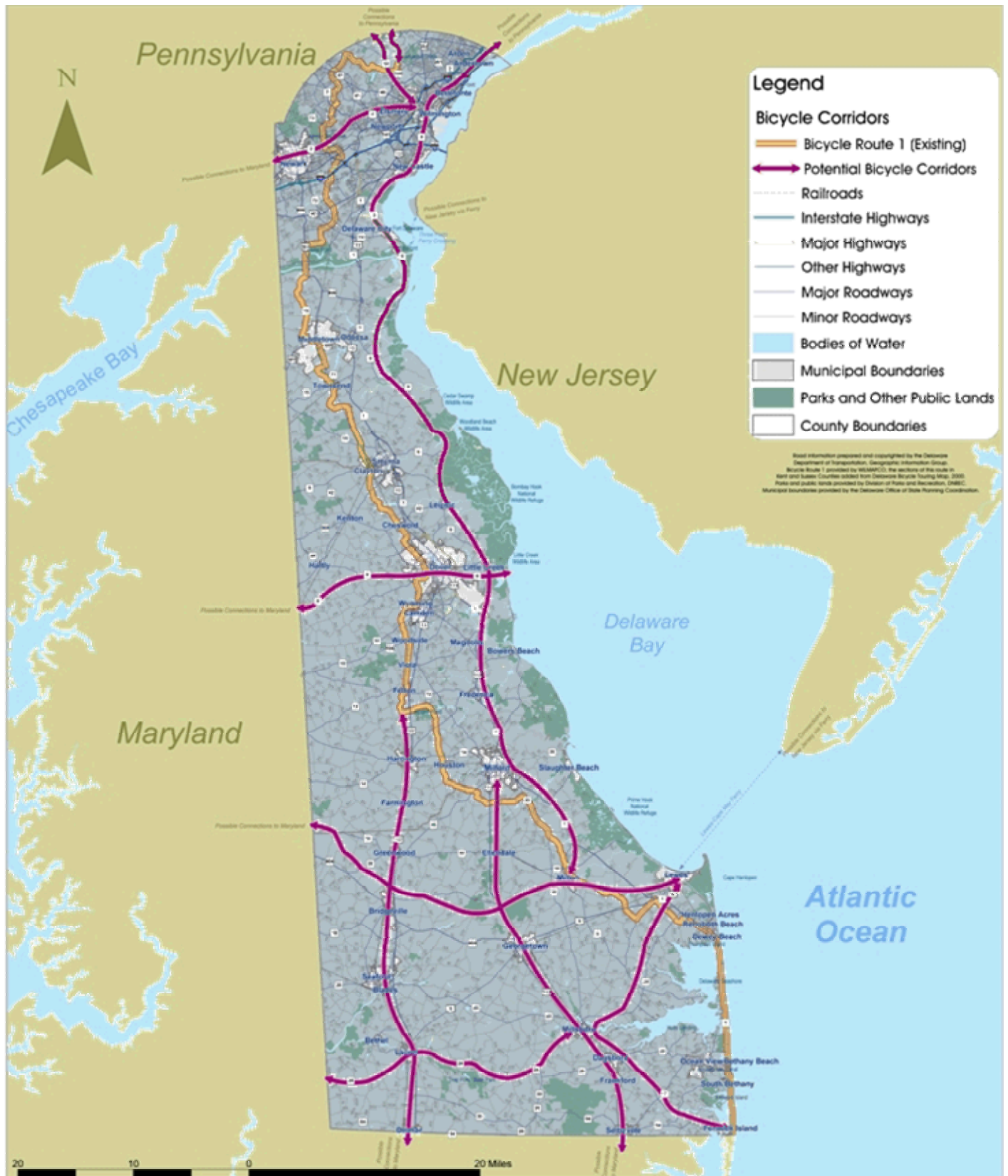
- **Identification of travel corridors.** DelDOT developed a set of conceptual corridors between major municipalities and destinations (i.e. the beaches) where a set of contiguous bicycle facilities do not currently exist. These **preliminary corridors** are illustrated in Figure 1.2.
- **Public outreach.** The initial travel corridors were presented to the public in a series of meetings in February 2004. People were encouraged to draw on corridor maps provided at the meeting and identify trouble spots, potential routes, and areas where they cycle. Participants were also asked about specific facility needs and safety concerns they felt must be addressed in order to encourage more people to use bicycles.
- **Development of routes.** The corridors presented to the public were refined into a series of on-road bicycle routes designed to connect municipalities and activity centers in the state.
- **Review of field conditions.** A windshield survey of each of the Statewide and Regional Bicycle Routes was conducted. Roadway conditions, major intersections, and water crossings were noted. To provide DelDOT engineers with a reference they may use when incorporating bicycle facilities into roadway design and maintenance, the field notes were compiled into the route summaries located in Appendix B.
- **Public review of routes.** A second round of public meetings was held to present the proposed routes (these routes were also posted to DelDOT's website for the Plan.) Meeting participants provided feedback and noted areas where alternative routes or route extensions may be appropriate.
- **Interviews with state agencies and organizations.** To understand the institutional issues associated with implementing the Plan, staff from the following departments within DelDOT were interviewed:
  - Planning - Development Coordination
  - Transportation Solutions-Project Development South
  - Transportation Solutions-Project Development North
  - Maintenance & Operations
  - Traffic Engineering
  - Delaware Transit Corporation (DTC)

In addition, representatives from the following organizations were interviewed:

- Delaware Bicycle Council
- Delaware Greenways

- Council on Greenways & Trails
- Delaware Department of Education
- Delaware Department of Natural Resources and Environmental Control (DNREC)
- Delaware Office of Highway Safety & Homeland Security
- Dover-Kent MPO
- WILMAPCO

The input provided from these groups was used to develop a set of implementation guidelines through which DelDOT may begin working towards a comprehensive statewide bicycle network.



**Figure 1.2. Preliminary Corridors.**

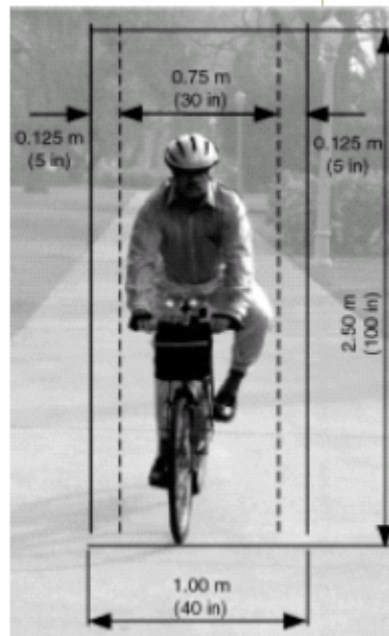


## 2.0 BICYCLE FACILITY NEEDS

In accordance with the Delaware Code, Title 17, Section 1006, bicycles may be operated “on existing roads, streets, parkways and other thoroughfares” except specifically signed controlled-access highways. While almost every roadway may be used by cyclists, the willingness of a bicyclist to use a roadway will vary according to their level of experience and the types of bicycle facilities provided. This section discusses the relationship between bicyclists and facility needs. The different types of bicyclists are described, as are the different types of bicycle facilities which may be included in a new or existing roadway.

### 2.1 CHARACTERISTICS OF BICYCLISTS

One of the advantages of bicycles is that they have a narrower profile than automobiles, making it easier to fit them on the roadway (see Figure 2.1.) However, bicyclists are more sensitive to changes in roadway conditions. Cracks in the pavement, railroad crossings, and other road features that would be a small inconvenience to a motorist may cause a bicyclist to fall—possibly into other traffic. Because of this, planning for bicycle facilities requires a finer level of detail than for motorized forms of transportation.



**Figure 2.1. Operating Space for a Bicyclist.**

Source: AASHTO *Guide for the Development of Bicycle Facilities*, Figure 1.

The experience of bicyclists varies significantly more than that of drivers. The AASHTO *Guide for the Development of Bicycle Facilities* defines three types of users:

**Type A:** Advanced or experienced riders are generally using their bicycles as they would a motor vehicle. They are riding for convenience and speed and want

direct access to destinations with a minimum of detour or delay. They are typically comfortable riding with motor vehicle traffic; however, they need sufficient operating space on the traveled way or shoulder to eliminate the need for either them or a passing motor vehicle to shift position.

**Type B:** Basic or less confident adult riders may also be using their bicycles for transportation purposes, e.g., to get to the store or to visit friends, but prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width to allow easy overtaking by faster motor vehicles. Thus, basic riders are comfortable riding on neighborhood streets and shared use paths and prefer designated facilities such as bike lanes or wide shoulder lanes on busier streets.

**Type C:** Children, riding on their own or with their parents, may not travel as fast as their adult counterparts but still require access to key destinations in their community, such as schools, convenience stores and recreational facilities. Residential streets with low motor vehicle speeds, linked with shared use paths and busier streets with well-defined pavement markings between bicycles and motor vehicles can accommodate children without encouraging them to ride in the travel lane of major arterials.<sup>1</sup>

Because there are different types of bicyclists, it should be understood that not every facility improvement will meet the needs of every cyclist. However, by recognizing the needs of different types of cyclists, DelDOT has a better understanding of what facility types may be appropriate for each setting.

## 2.2 FACILITY NEEDS OF BICYCLISTS

In order to understand the specific concerns of bicyclists in Delaware, a public outreach program was conducted for this Plan. As part of this process, participants identified a set of basic facility needs which influence their decision on whether or not they are willing to bicycle (or let their children ride bicycles) on roadways:

- **Safe, dedicated bicycle facilities.** Many people related their comfort in cycling on a road to the presence of a dedicated travelway for bicycles. This was considered especially important along roadways with high volumes of traffic or higher posted travel speeds. The maintenance of bicycle facilities was also raised as a concern, as debris was considered to be a safety hazard to cyclists.
- **Continuous bicycle facilities.** The public expressed a general need for a network of bicycle facilities. A consistent, continuous network of bikeways is necessary to make people feel comfortable using bicycles to meet their everyday transportation needs. The utility of a bicycle route was generally associated with how well it connected to activity centers and other bicycle facilities. On a more local scale, people noted that on-road bicycle facilities have commonly been displaced or removed when roadway modifications (such as turn lanes) are implemented to accommodate new developments.

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<sup>1</sup> AASHTO Guide for the Development of Bicycle Facilities, p. 6. 1999.

- **Safe crossings.** Several comments were made that the most dangerous cycling conditions are encountered at bridges, underpasses, and overpasses. In these instances, cyclists noted that roadways may be too narrow to safely accommodate both motor vehicles and bicycles. Bicyclists also noted that the speed of traffic at these locations made them feel less safe.
- **Additional needs of children.** Some people at the public meetings noted that they would not let their children ride bicycles on streets without dedicated bicycle facilities. This confirms the conventional wisdom presented in the AASHTO guidelines indicating that additional improvements may be appropriate on roadways which may be used by children for bicycling.

## 2.3 BASIC TYPES OF FACILITIES

There are several types of bicycle facilities which may be implemented to meet the needs expressed by the public. The following is a summary of the facility types included in this Plan.

### 2.3.1 Bikeways

The existing Bicycle Policy (PI# D-06) defines a bikeway as “any road, street, path or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are to be shared with other transportation modes.” The DelDOT *Road Design Manual* identifies four types of bikeways. This Plan designates a network for which a higher level bikeway will be provided, therefore there is some design differences between facilities designated in the Plan and those for bikeways along general roadways as described in the *Road Design Manual*.

Descriptions of bikeway types included in this Plan are provided below:

- **Bike Lane.** 5 foot minimum lane width with striping, bike symbols, and route designation. Warning and regulatory signage to be provided. The guidelines for Bike Lanes establish preferential use by bicyclists.
- **Shared Shoulders.** 5 foot minimum width paved shoulder. Includes some signage and bicycle symbols. As a shared bikeway this facility maintains use of the shoulder for motorist breakdowns or emergencies while providing a facility for bicyclists separated from the travel lane. Parking on shoulders should be prohibited.
- **Wide Outside Travel Lane.** A 14 foot wide outside travel lane to be shared by motorists and bicyclists. Warning and regulatory signage to be included but no striping to be provided.

## 2.4 ELEMENTS OF BIKEWAYS

### 2.4.1 Traffic Controls

Signage and striping help to define designated bicycle routes. Signage conveys directional information and can identify the route on which the cyclist is traveling. Signage is also important to alert motorists to the presence of bicycles along a roadway.

Striping helps to separate bicycle and motor traffic, which is especially important to Type “B” and “C” cyclists to increase their level of comfort using on-road facilities. Used in combination, striping and route signage improve safety. They also establish continuity of the path of travel as sought by the public.

Traffic signalization has a role in establishing the safety of a bicycle route. Bicycles may require more time to cross an intersection than an automobile. DelDOT's Traffic Engineers can assess whether the “green time” assigned to a traffic movement may need to be adjusted to improve the safety of a bicycle crossing.

#### **2.4.2 Intersection Treatments**

In Delaware, bicycles are required to obey the same laws as motorized vehicles; however, they are generally not able to travel through an intersection as quickly as automobile traffic. Intersections with high volumes and/or multiple lanes of traffic pose a safety concern and may deter less experienced cyclists. Signage and striping may be appropriate to ensure safe bicycling through an intersection or interchange.

#### **2.4.3 Bridge Treatments**

Bridges are a point where the roadway may narrow, putting bicyclists at more exposure to conflicts with automobile traffic. In Delaware, there are major bridges at water and rail crossings and highway overpasses that are of particular concern. These are locations where bicyclists can be faced with traveling over a bridge that carries high volumes of traffic often moving at higher speeds. At the same time it is clear that the ability to add an exclusive bicycle facility on an existing bridge may be limited.

#### **2.4.4 Interchange Treatments**

Interchange ramps may create situations where bicyclists have to deal with the weaving movements of automobiles entering or leaving the highway. The design of highway ramps may also limit the line of sight between automobiles approaching a roadway and bicyclists along the road.

#### **2.4.5 Other Design Considerations**

Bicyclists are particularly susceptible to abrupt changes in surface conditions. Potholes, debris, and other variations in the roadway which may not affect automobile traffic to the same extent can become an obstruction or create an impact that leads to bicycle accidents. Because of this, it is important to provide cyclists with a clear, smooth, consistent path of travel. Maintenance of bicycle facilities is therefore more critical. Elements of roadway design that could create an obstruction along a bikeway include:

- **Drainage Inlet Grates**
- **Utility Covers**
- **Railroad Crossings**
- **Rumble Strip**

- **Traffic Calming Devices (e.g. speed humps, bulb outs, traffic islands)**
- **On-Street Parking**

## **3.0 FACILITY RECOMMENDATIONS**

The following sections explain the hierarchy of the statewide bicycle facility network and the facilities required for its implementation.

### **3.1 ROUTE RECOMMENDATIONS**

#### **3.1.1 Explanation of Hierarchy**

The majority of Delaware's roadways function as bikeways and in accordance with the Delaware Code (Title 17, §1006) should be developed and maintained to support bicycling. However, it is not possible to provide priority treatments for bicycling on every road in the state. By designating a planned network of bicycle routes, DelDOT will be able to focus its resources to promote increased bicycling as one strategy for meeting local, regional, and statewide mobility needs.

This Plan only provides route and design recommendations for Statewide, Regional, and Recreational Connector routes. At the same time, it is recognized that there are five tiers in the overall statewide network as listed below:

- **Statewide Bicycle Routes**
- **Regional Bicycle Routes**
- **Recreational Connectors**
- **Feeder Routes**
- **Undesignated Bikeways**

Bicycle routes anticipated to serve longer trips and greater numbers of cyclists would have more facility improvements while bikeways serving local trips would receive only basic improvements to enhance safety and mobility. The function and characteristics of each type of route are described in the following paragraphs.

#### **3.1.2 Statewide Bicycle Routes**

Statewide Bicycle Routes have been designated to provide north-south connections between New Castle, Kent and Sussex Counties and from Delaware into Maryland and Pennsylvania. They are also critical in crossing the most significant physical barriers for bicycle travel, I-95 and the Chesapeake and Delaware Canal.

Recognizing that long-distance, inter-county trips are typically made for recreational purposes, the Statewide Bicycle Routes have been designated through some of the most scenic areas in the state on roads with lower traffic volumes.

Statewide Bicycle Routes are intended to mirror the advantages of existing routes such as Bicycle Route 1, while providing improvements to accessibility, connectivity and safety.

#### **3.1.3 Regional Bicycle Routes**

Regional Bicycle Routes form the backbone of the bicycle network, providing direct connections between larger municipalities and activity centers. These routes have been



designated predominantly on major roadways to minimize bicyclist's travel times and to increase the viability of utilitarian type bicycling such as for work and shopping trips.

### **3.1.4 Recreational Connectors**

Recreational Connectors link local activity centers and recreational areas to the greater bicycle network. The majority of these routes are designated within rural areas where the *Delaware State Strategies for Policies and Spending* recommends limiting investments in new transportation facilities. The intent of designating a discreet set of roadways in rural areas is to minimize the impact while encouraging alternative modes of transportation.

### **3.1.5 Feeder Routes**

Feeder Routes are defined as those routes which are not part of the formal on-road bicycle network maintained by DelDOT. The purpose of Feeder Routes is to provide local bicycle mobility in municipalities and recreational areas. Feeder Routes are also the most suitable for children to ride. There are three main types of Feeder Routes:

- **Rails-to-Trails.** These multi-use trails are being developed on abandoned railroads throughout the state of Delaware. The Rails-to-Trails program has just begun at the time the Bicycle Facility Master Plan was initiated, and both plans will be implemented in coordination with one another.
- **Off-road facilities.** These include existing trails in state parks, wildlife refuges, forests and in local parks. DNREC, DelDOT and municipalities that provide off-road facilities should coordinate with one another to ensure uniform bicycling conditions along such feeder routes.
- **Local bicycle routes.** These are on and off-road facilities designated and/or implemented within municipalities. The most extensive network of such routes is in the City of Newark; however, other local routes are found throughout the state. It is recommended that municipalities follow the guidelines provided in this plan to provide continuity of the overall bicycle network.

### **3.1.6 Undesignated Bikeways**

Undesignated bikeways are available to bicyclists and link with the designated bicycle network identified in the Bicycle Facility Plan. Undesignated bikeways provide access to most areas of the state. The undesignated bikeways include local streets that carry many of the bicycle trips made by less-experienced bicyclists. The Road Design Manual standards for provision of bicycle facilities apply to these roads.

## **3.2 DESIGN RECOMMENDATIONS**

Implementation of the Delaware Bicycle Policy began in November 2000. This section describes how DelDOT's current design and implementation practices relate to the Bicycle Facility Master Plan. This section provides a summary of the design recommendations for each type of facility included in the Facility Plan. The design guidelines referenced below are provided in Appendix A of this plan.

### 3.2.1 Bikeways

#### Current Conditions

There are a number of existing bikeways throughout Delaware, primarily in urbanized areas and popular recreational areas (i.e. the City of Newark, White Clay Creek State Park, the communities along the Atlantic Ocean, etc.) While these bikeways improve local mobility, DelDOT's role is to link them into a comprehensive network in order to provide better regional and statewide bicycle mobility.

Some of the existing local bicycle routes do not conform to the current standards established by the *Road Design Manual*. Figure 3.1 illustrates one such bicycle lane in the City of Newark. The presence of the lane increases awareness of bicycle travel, yet it is narrower than current standards for bicycle lane width. This Facility Plan calls for such facilities to be upgraded to meet the new standards when road rehabilitation or reconstruction occurs.

#### Recommended Practices

It is important that the existing bike facilities be tied together into a comprehensive bicycle network. The routes recommended in this Plan will serve as the backbone of such a network, improving connectivity between existing bikeways and linking activity centers throughout the state. The development of a statewide bicycle network may also help to promote local bicycle facility improvements by putting them in the context of local, regional, and statewide bicycle mobility. The development and maintenance of a bicycle network will also increase the public's awareness of bicycling options and will encourage more bicycling.

Existing bike facilities should be upgraded to meet or exceed the criteria established in the design guidelines. Upgrades should be completed as part of regular roadway maintenance and construction activities.



**Figure 3.1. Bicycle lane on College Avenue, Newark, DE.**

#### Summary of Design Guidelines

- This Plan establishes a 5 foot minimum width for bike lanes and shared shoulders. For rural roadways, where no curb is present, a 4 foot minimum width can be established.
- Where it is determined that bicycle and vehicular traffic will share a general travel lane, the outside travel lane should be a minimum of 14 feet wide.
- Where a shared travel lane occurs with high volumes of traffic or posted speeds of greater than 30 mph, additional lane width may be appropriate.
- It is critical that bikeways provide a smooth, even travel surface. There should be no more than a  $\frac{3}{4}$ -inch longitudinal drop-off between the general travel lane and shoulder pavement or between the shoulder and the gutter pan.
- The facility features to be provided by Route type are shown in Table 3.1 below.

**Table 3.1: Bicycle Facility Features by Route Type**

	<b>Type of Bicycle Routes</b>	<b>Statewide Bicycle Route</b>	<b>Regional Bicycle Route</b>	<b>Recreational Connector</b>
R- Required P- Preferred				
<b>Minimum Facility Width</b>		5'	5'	5'
<b>Facility Improvements</b>				
Bike Route Number Signs		R	R	n/a
Warning & Regulatory Signs		R	R	R
Bicycle Symbols		R	R	P
Bicycle Friendly Drainage Grates		R	R	R
Right angled railroad crossings		R	R	R
Utility Covers out of path or flush		R	R	R

- In satisfying the Plan's design guidelines, Statewide, Regional, and Recreational Connectors bicycle routes can be built as bike lanes, shared shoulders, or wide outside travel lanes as determined by DelDOT staff.
- The considerations listed in Table 3.2 should be taken into account when determining the appropriate type of bikeway to be installed for a designated bicycle route.
- The 5' width for Bicycle Facilities recommended in this Plan should be able to be accommodated within the Road Design Manuals standard cross section for new road construction and 4-R Improvements. (Road Resurfacing, Restoring, Rehabilitation, Reconstruction).
- Where local conditions make it infeasible to meet these guidelines, the project manager will be required to seek a waiver by following the process described in Section 7 of this Report.

The plan guideline details are provided in Appendix A.

**Table 3.2: Bikeway Types included in Bicycle Facility Master Plan**

<b>Type of Bikeway</b>	<b>Plan Guidelines</b>	<b>Considerations</b>
Bike Lane	5' wide lanes with striping, bike symbols route designation, warning and regulatory signage to establish preferential use by bicyclists.	Most beneficial type of facility for less experienced riders (Group C) but difficult to fit within existing roadways. Best for roadways with on-street parking.
Shared Shoulder	Paved shoulder at least 5' wide. Includes signage and bike symbols. Establishes intent for shoulder to be shared by bicyclists and motorists.	This type of facility is suitable for basic bicyclists. A shared shoulder bikeway maintains emergency use of shoulder for motorist breakdowns/emergencies while providing a facility for bicyclists separated from the travel lane. Parking on shoulders to be prohibited.
Wide Outside Travel Lane	14' wide outside traffic lane to be shared by motorists and bicyclists. Warning and regulatory signs included but no striping provided.	Most applicable type of bikeway for roadways with low speeds and lower traffic volumes; intended for more advanced bicyclists

### 3.2.2 Traffic Controls

#### Current Conditions

DelDOT currently uses the majority of the bicycle signs listed in the *Manual on Uniform Traffic Control Devices (MUTCD)*. However, more consistent application of this signage across the state is recommended. A problem now exists where narrow bridges, interchanges, etc., create barriers to bicycling and such locations lack warning signs regarding the potential conflict. There is also a concern that the “Share the Road” signs have been installed on so many roadways that they become visual clutter and fail to catch motorists’ attention.

There are variations in bicycle lane striping and bicycle route directional signage found throughout the state. Directional signage is provided for Bicycle Route 1; however, some of the local routes lack route designation signs and signage for bicycle routes to which

they may connect. In addition, the current directional signage does not indicate the beginning or end of the route or major destinations along bicycle routes.

### Recommended Practices

The Statewide and Regional Bicycle Routes should be signed and marked to enhance both bicyclist and motorist awareness of bicyclists. Directional signage should be added at the intersections of all designated bicycle routes to make cyclists aware of other destinations which may be reached on the bicycle route network.

The design guidelines in this Facility Plan should be followed to achieve uniformity in the striping, signage, and markings. Roadways designated by this plan as bicycle routes should also be inventoried for hazards and barriers to bicycling and if found should be marked with warning signs. The route descriptions provided in Appendix B note barriers and general conditions for recommended statewide and regional routes.

### Summary of Design Guidelines

Bicycle route warning and regulatory signage is required for all bicycle routes in the Plan network. Specific guidance for the placement and spacing of signs can be found in Appendix A. The following signage should be placed along on-street bikeways:

- Share the Road. (W11-1, W16-1: See Figure 3.2.) These are currently the most common type of bicycle signs used in the State of Delaware. While these signs do raise awareness of bicycle traffic, like any type of warning, overuse tends to lessen their effectiveness. It is recommended that “Share the Road” signage be used only where an area has a history of bicycle accidents or where bicycles may need to move into the general travel lane.



**Figure 3.2: Share the Road signage.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

- Bicycles Prohibited. These are required at the entrances to all signed controlled-access highways.



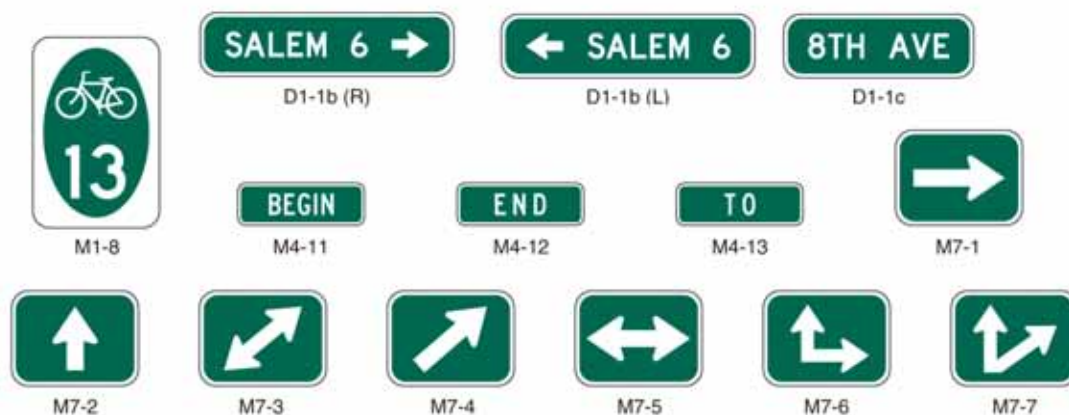
- Bicycle Surface Condition Warnings. (W8-1, W8-2, W8-10, W8-10p, W10-1.) Such signage is appropriate where there are sudden changes in road conditions, i.e. gaps between a road and a bridge deck, dips in the road, etc. (See Figure 3.3)



**Figure 3.3: Bicycle Surface Condition Warnings.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

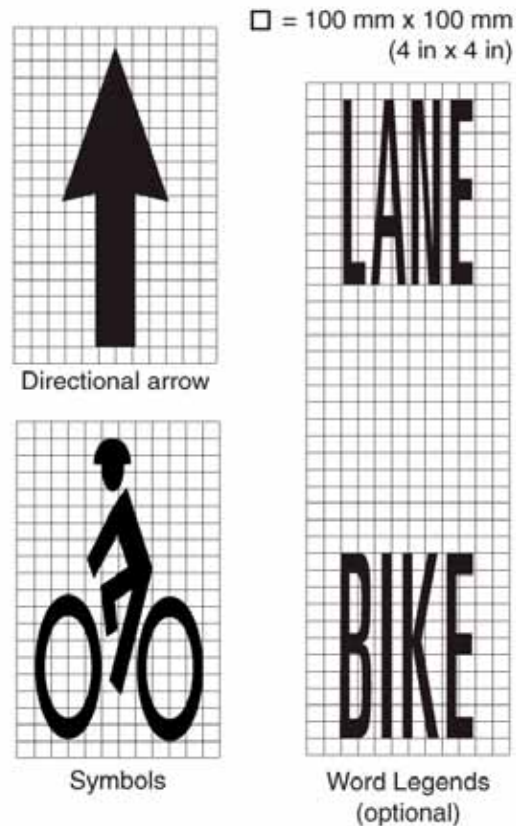
Statewide Bicycle Routes and Regional Bicycle Routes should have directional signage indicating the route name, endpoints, major destinations, and connecting routes. Figure 3.4 illustrates the types of route guide signs which are appropriate for these routes.



**Figure 3.4. Guide Signage for Statewide Routes.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

Bike Lanes should be striped in accordance with the guidelines provided by AASHTO *Guide for the Development of Bicycle Facilities*. In addition, Bike Lanes and shared shoulders should be painted with bike lane symbols to increase awareness of bicyclists. Where a bike facility exists in a shared shoulder, parking should be prohibited. Figure 3.5 illustrates typical bike symbols used in Delaware. Guidelines for striping and the placement of bike lane symbols have been included in Appendix A.



**Figure 3.5. Typical Bike Lane Symbols.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

### 3.2.3 Intersection Treatments

#### Current Conditions

There are several intersection treatments in Delaware that were installed prior to the establishment of uniform bicycle facility guidelines and, as a result, there are variations in existing conditions for bicycle crossings. Figure 3.6 depicts existing conditions. The top photo shows a bicycle intersection crossing which is in conformance with current AASHTO guidelines; the center photo depicts a treatment which is not in conformance with these guidelines. The bottom photo shows a case where a dashed line has been applied through the intersection—a treatment not in conformance with AASHTO guidelines.



*In conformance with AASHTO guidelines*



*Not in conformance with AASHTO guidelines*



*Not in conformance with AASHTO guidelines*

**Figure 3.6. Treatment of bicycle lanes at intersections along SR 24, SR 26, and South State Street.**

## Recommended Practices

Design guidelines for intersection treatments are provided in this Facility Plan. These design guidelines will accomplish three things:

- Provide consistent guidance for DelDOT to accommodate bicycle travel through intersections.
- Ensure that developers have sufficient guidance for treating bicycle crossings along DelDOT-maintained roads and do not omit or improperly implement such crossings.
- Establish consistency in treatments of intersections and thereby meet the expectations of cyclists and motorists at intersections throughout the state.

Specific recommendations for bicycle facility markings at intersections are described in Appendix A.

## Summary of Design Guidelines

Where bicycle lanes have been striped along roadways, the striping should not extend through an intersection. Where such striping currently exists through an intersection, it should be removed when the intersection is re-striped, reconstructed, or otherwise modified.

Bike Lanes should be striped to the stop bar when there is room to accommodate the bicycle lane at the approach to the intersection. Solid bicycle stripes should be replaced with a dotted line in three circumstances only:

- Where vehicular traffic crosses over from the through lane and into the right turn lane.
- Where there is no dedicated right turn lane, but there are heavy volumes of right-turning traffic.
- At transit stops.

If the presence of dedicated turn lanes makes it unfeasible to stripe a bicycle lane to the stop bar, the striping of the bicycle lane should be discontinued prior to the turn lanes to allow bicyclists adequate distance to merge with general traffic. Examples of recommended striping for intersections are provided in Appendix A.

At all intersections, it is to be assumed that the bicyclist is allowed the option of making either a “vehicular style” left turn (where the bicyclist merges leftward to the same lane used for motor vehicle left turns) or a “pedestrian style” left turn (where the bicyclist proceeds straight through the intersection, turns left at the far side, then proceeds across the intersection again on the cross street).

The need for safe bicycle crossings should be considered at all signalized intersections along bikeways. Changes to signal timing may be appropriate at intersections along well-traveled bicycle routes.

Simple roundabouts (i.e. roundabouts with one lane of traffic) should not be striped with bicycle lanes. Bicycle lane striping should end prior to the roundabout to give cyclists adequate time and distance to merge with general traffic. At multi-lane roundabouts, special treatments (shared use paths, bicycle lanes, alternate routing) should be explored to improve bicycle safety.

Specific details and examples of intersection treatments can be found in Appendix A.

### **3.2.4 Bridge Treatments**

#### **Current Conditions**

In many rural areas, bicycle travel across bridges is easily accommodated by wide shoulders across the bridge. However, some bridges in Delaware's urban areas have sidewalks but lack room for bikeways. (See Figure 3.7) As traffic volumes at such locations are typically higher (and often moving at speeds exceeding 30 mph), there is an increased potential for bicycle-automobile conflicts.

The bridges across the Chesapeake and Delaware Canal—the Reedy Point Bridge, the St. Georges Bridge, and the Summit Bridge—constitute the largest barriers to north-south bicycle travel in the state. The volume and speed of traffic along these bridges may be hazardous to bicyclists, while the height and length of these bridges increases the potential for bicycle-automobile conflicts. Currently, there are no specific facility accommodations for cyclists on these bridges.

#### **Recommended Practices**

There are bridges that present some of the greatest challenges to providing a continuous bicycle route. Bridge improvements designed to enhance bicycling should be evaluated on a case-by-case basis. Where bridge improvements cannot sufficiently address safety, bicyclist should be required to dismount and use the sidewalk to cross bridge. If sidewalks are not available, "Share the Road" signage should be used to alert motorists to the presence of bicyclists.

#### **Summary of Design Guidelines**

The bridges along DelDOT maintained roads with bikeways should be evaluated for bicycle safety. Where traffic volumes of 2,000 AADT or less occur, it is acceptable to allow bicyclists to travel in general traffic lanes; in all other there cases, efforts should be made to provide a bikeway separated from motorized traffic.

Where the shoulders of a bridge are currently narrower than five feet, it would be appropriate to investigate the feasibility of reducing the width of the vehicular lanes to increase the width of the shared shoulder.

Bicycles should not be permitted to ride on pedestrian facilities across bridges unless (a) there are two, one-way crossings of six feet each; or, (b) there is one crossing which is a minimum of ten feet wide. In all other cases, bicyclists should use the travel lane or dismount and walk their bicycles across the bridge.

Bridges with metal grates may constitute a slipping hazard for bicycles. In such instances, the gaps in the grate may be filled along shoulders used by bicycles.

It is difficult to add bicycle facilities to an existing bridge. Where it is not possible to provide the recommended bicycle facility accommodations then the improvements should be fully considered when the bridge is identified for reconstruction or re-decking. Bike facilities should be added as part of bridge modifications when they may be provided at reasonable cost.

Where there is insufficient shoulder width to accommodate a bicycle facility on a bridge and its approaches, the bicycle facility should be terminated prior to the bridge structure to allow bicyclists adequate time and distance to merge with traffic. In such instances, “Share the Road” signage should be posted at the approaches to the bridge to give motorists warning of the potential for bicycle traffic. Additional treatments (bicycle loop detectors, flashing lights, etc.) may be appropriate on the major bridges, especially those along the Chesapeake and Delaware Canal.

### **3.2.5 Interchange Treatments**

#### **Current Conditions**

Currently, there is no specific DelDOT guidance for the treatment of bicycle facilities at interchanges. In many cases, shoulder widths through interchanges are suitable for bicycling; however, lines of sight between interchange ramps and the local roadway may be limited, creating a potential safety hazard.

#### **Recommended Practices**

The design guidelines in this Facility Plan should be implemented at all interchanges that intersect Statewide Bicycle Routes, Regional Bicycle Routes, and Recreational Connectors.

#### **Summary of Design Guidelines**

The Facility Plan design guidelines for interchanges should be applied on all Bike Routes. Where the line of sight between interchange ramps and bikeways may be limited, efforts should be made to limit the area of conflict between cyclists and motorists. Bicycle warning sign (W 11-1) should be used at off-ramps which cross Statewide Regional and Recreational Connector routes.

As with intersections, bicycle lanes should not be striped roadway ramps. Bicycle lane striping is appropriate on overpasses and underpasses.



**Figure 3.7. Two bridges along SR 54, west of Fenwick Island.**

Note in the top photo how the sidewalk reduces the shoulder available for bicycle travel.



### 3.2.6 Other Design Considerations

#### Current Conditions

As noted previously, minor variations in road conditions may cause a bicyclist to lose control. The majority of the existing drainage grates, utility covers, railroad crossings, and rumble strips were implemented without consideration for bicycles and may need to be retrofitted or relocated to improve bicycling conditions.

Where traffic calming devices, on-street parking, and other design features are installed, the benefits to pedestrians and automobiles must be weighed versus their potential impact on bicycles. As some design features are relatively new to the DelDOT roadway network, it may be necessary to accumulate more historical accident data to determine their impacts on bicycle traffic.

#### Recommended Practices

The design guidelines provided in this plan should be implemented along all on-road bikeways to ensure a uniform, safe traveling surface for bicycle traffic.

In addition, it is recognized that there are some types of bicycle facilities which are not currently accepted as standard, but may have applications in specific locations in the DelDOT roadway network. DelDOT should consider non-standard applications in high-accident locations or where design constraints prohibit more conventional solutions (e.g. bridges over the Chesapeake & Delaware Canal, urban areas with heavy traffic but limited right-of-way.)

#### Summary of Design Guidelines

- **Drainage Inlet Grates.** Where drainage grates have slots parallel to the roadway, there is the potential for a bicycle wheel to get trapped in the slot and cause an accident. To avoid this, drainage inlet grates should be designed with slots that will not catch a bicycle tire. Drainage inlets may be retrofitted or replaced to accomplish this.
- **Utility Covers.** Utility covers may create an obstruction along a bikeway if they are not flush with the ground. Where possible, utility covers should be made flush with a bikeway or moved outside of the bikeway.
- **Railroad Crossings.** Where railroad crossings are not perpendicular to the roadway, the potential exists for a bicycle tire to get caught in the flangeway and for the bicycle to overturn. Such situations may be corrected by rerouting the bikeway to cross the tracks at an angle of at least 45 degrees. Alternatively, such crossings can be marked with a warning sign. Figure 3.8 illustrates signage used by the Oregon Department of Transportation for this purpose; MUTCD Sign W 11-59.3, shown in Appendix A, is similar and would be appropriate for Delaware bikeways.





**Figure 3.8. Railroad Bicycle Crossing Sign OBW8-20 used by the Oregon Department of Transportation.**

Source: *Oregon Pedestrian and Bicycle Plan*.

- **Rumble Strips.** The standards provided by the *DelDOT Road Design Manual* should be followed when using rumble strips in conjunction with Bike Lanes or shared shoulders. Ridges used to create rumble strips should be perpendicular to the bikeway and should be no greater than  $\frac{3}{4}$ -inch in depth. Rumble strips should be implemented such that there is a clear path of one foot from the rumble strip to the outside edge of the roadway. Furthermore, there should be a clear area of at least four feet between the rumble strip and the outside edge of the shoulder (five feet where there is a guardrail, curb, or other obstacle.)
- **Traffic Calming Devices** (e.g. road humps, traffic islands, bulb outs.) It is recommended that bikeways be preserved through areas in which traffic calming devices have been installed. The exception to this is at simple roundabouts, where the bike lane should end prior to the roundabout (see 3.2.3 for details.) *The Delaware Traffic Calming Manual* specifies that special signing shall be provided along traffic calmed streets that are designed as bicycle routes. Appropriate signing shall be used at closures and diverters to indicate that bicycle access is maintained.
- **On-Street Parking.** When designated on roadways with on-street parking, bikeways should be to the left of the parking lane. Bikeways should never be put between the parking lane and the curb.

## 4.0 BICYCLE ROUTES

The key to the implementation of this Facility Plan is the development of a comprehensive statewide bicycle network (rather than just a series of isolated, unconnected local improvements.) As summarized in Table 4.1, the proposed bicycle network spans over 1,700 miles—almost 40% of the total road network maintained by DelDOT. The routes of this network are summarized in this section and illustrated in the maps provided with this plan. Detailed descriptions of the Statewide and Regional Bicycle Routes are included in Appendix B.

**Table 4.1. Mileage Summary of Bicycle Routes by Type**

Statewide Totals	Miles of Designated Bikeway	% of Total DelDOT Road Network (4,385 mi.)
Recreational Connectors	979	22.3%
Regional Bicycle Routes	406	9.3%
Statewide Bicycle Routes	335	7.6%
<b>Statewide Mileage</b>	<b>1,720</b>	<b>39.2%</b>

### 4.1 NEW CASTLE COUNTY

Table 4.2 summarizes the Statewide Bicycle Routes and Regional Bicycle Routes in New Castle County. There are 126 miles of Statewide Bicycle Routes, 71 miles of Regional Bicycle Routes, and 310 miles of Recreational Connectors in New Castle County. All of the municipalities in New Castle County are served by designated bicycle routes (of these, only Arden, Ardentown, and Ardencroft are not served by Statewide or Regional Bicycle Routes.) The Statewide and Regional Bicycle Routes also provide direct access to all of the state parks, wildlife areas, and wildlife refuges in New Castle County.

New Castle County has some of the state's most significant bicycling mobility barriers:

- **I-95.** This highway affects cycling conditions on all of the roadways with which it intersects. Interchanges along I-95 create conditions where vehicular traffic on the ramps may not have adequate sight distances to react to bicycle crossings; also, traffic volumes and traffic speeds at these interchanges may deter less experienced bicyclists. Where roadways such as Salem Church Road use overpasses to get across I-95, the bridges frequently have shoulders that are narrower than the minimum recommended width for bikeways.
- **Chesapeake & Delaware Canal.** The C&D Canal traverses the entire Delmarva Peninsula, creating a 450 foot wide barrier between northern New Castle County and the rest of the state. There are three bridges over the C&D Canal which serve Statewide and Regional Bicycle Routes:
  - Reedy Point Bridge
  - St. George's Bridge
  - Summit Bridge

None of these bridges is presently scheduled for reconstruction or re-decking; therefore, it may be necessary to develop innovative ways to improve bicycling conditions along these bridges. Enhancements may include: bicycle-actuated warning lights, additional signage, or re-stripping of shoulders along the bridges.

- **Wilmington urbanized area.** Wilmington is a well-established urbanized area, with street widths and traffic conditions typical of many older, East Coast cities. It may be difficult to install bike facilities which conform to the design recommendations of this plan in Wilmington and other urbanized areas; however, they are significant destinations which are likely to attract larger volumes of bicyclists than other portions of the bicycle network. Therefore, facility improvements must be made to improve cycling conditions in these areas.

**Table 4.2. Designated Statewide and Regional Routes in New Castle County**

Bicycle Routes			Roadways followed	Length (mi.)	Municipalities and Activity Centers Served
Statewide Bicycle Routes	1	Bicycle Route 1		70	Newark, Middletown
	2	Wilmington-Selbyville	Kennett Pike Greenway, US 13, SR 9	56	Wilmington, New Castle, Delaware City, Odessa
Regional Bicycle Routes	NC-1	Brandywine to Naamans Corner	US202 /SR 92 to SR 92/US 13	6	Brandywine, Naamans Corner, Delaware River
	NC-2	Delaware City to White Clay Creek State Park	SR 9/ SR 896 To SR 72/SR 7	23	Newark, White Clay Creek State Park, Delaware City, Ft. DuPont State Park
	NC-3	Newark to Wilmington via White Clay Creek State Park	SR 2 , SR 34, SR 48 to US 13	15	Newark, Stanton, Marshalltown, White Clay Creek State Park, Wilmington
	NC-4	MD Border to Bike Route 1	SR 273 at MD Border to SR 273/SR 141	13	Newark, Ogletown, Christiana, Pleasantville, New Castle
	NC-5	Newark Circulator	Newark SR 4 from SR 896 to SR 273	5	Newark
	NC-6	MD Border To Newark	SR 896 to SR 2/SR 72	4	Newark, University of Delaware
	NC-7	Middletown to Odessa	SR 71/SR 299 to SR 299/SR 9	5.0	Odessa, Middletown

## 4.2 KENT COUNTY

Table 4.3 summarizes the Statewide Bicycle Routes and Regional Bicycle Routes in Kent County. There are 92 miles of Statewide Bicycle Routes, 102 miles of Regional Bicycle Routes, and 307 miles of Recreational Connectors in Kent County. All but two of the

municipalities in Kent County are served by Statewide Bicycle Routes and/or Regional Bicycle Routes. (Kenton is connected via Recreational Connectors, while Hartly will be connected to the proposed Clayton-Easton Rail-to-Trail project.)

There are no major physical barriers to bicycling in Kent County, although traffic conditions in urbanized areas, US 13, and US 113 may create local safety concerns to less experienced bicyclists.

**Table 4.3. Designated Statewide and Regional Routes in Kent County**

Bicycle Routes			Roadways followed	Length (mi.)	Municipalities and Activity Centers Served
Statewide Bicycle Routes	1	Bicycle Route 1		38	Clayton, Cheswold, Dover, Wyoming, Felton, Houston
	2	Wilmington-Selbyville		42	Leipsic, Dover, Magnolia, Frederica, Milford, Cedar Swamp Wildlife Area
Regional Bicycle Routes	3	Delmar to Felton		12	Harrington, Farmington
	K-1	MD Border To Woodland Beach	SR6 to Woodland Beach	18	Clayton, Smyrna, Woodland Beach Wildlife Area
	K-2	NE Dover To Kitts Hummock/Delaware Bay	SR 9/CR 337 to US 1	11	Little Creek, Little Creek Wildlife Area, Dover Air Force Base, John Dickenson Plantation, Kitts Hummock
	K-3	MD Border To Port Mahon	SR 8 to SR 15 to Port Mahon Road	24	Dover, Little Creek, Port Mahon
	K-4	MD Border To Dover Air Force Base	SR 10 to US 113	16	Wyoming, Camden, Dover Air Force Base
	K-5	MD Border To W. Frederica	SR 12 to SR 12/CR 380	14	Felton, Frederica
	K-6	MD Border to Slaughter Beach	SR 14 at Maryland Border to SR 36 in Sussex County	19	Harrington, Houston, Milford, Slaughter Beach, Milford Neck Wildlife Area

### 4.3 SUSSEX COUNTY

Table 4.4 summarizes the Statewide Bicycle Routes and Regional Bicycle Routes in Sussex County. There are 117 miles of Statewide Bicycle Routes, 227 miles of Regional Bicycle Routes, and 366 miles of Recreational Connectors in Sussex County. With the exception of Bethel, of the municipalities in Sussex County are served by Statewide Bicycle Routes and/or Regional Bicycle Routes.

The most significant barriers to bicycling are along SR 1 between Lewes and Fenwick Island. The Delaware beaches are a resort destination which generates congestion along SR 1 throughout much of the summer. The auto-oriented development along this roadway presents a challenge to bicyclists, as the numerous driveways create potential points of conflict between automobile and bicycle traffic. Although it may be difficult to improve bicycling conditions along SR 1, it is a major destination for tourists, residents, and employees; therefore, it must be integrated into the statewide bicycle network.

**Table 4.4. Designated Statewide and Regional Routes in Sussex County**

Bicycle Routes			Roadways followed	Length (mi.)	Municipalities and Activity Centers Served
Statewide Bicycle Routes	1	Bicycle Route 1		49	Newark, Middletown
	2	Wilmington-Selbyville	Kennett Pike Greenway, US 13, SR 9	39	Wilmington, New Castle, Delaware City, Odessa
Regional Bicycle Routes	3	Delmar-Fenton	US 13	29	Greenwood, Bridgeville, Seaford, Blades, Laurel, Delmar
	S-1	Greenwood to Broadkill Beach	SR 16/US 113 on SR 26 to Broadkill Beach	22	Greenwood, Ellendale, Pine Hook National Wildlife Refuge, Broadkill Beach
	S-2	West Milton To Millsboro	SR30/SR16 to SR30/SR26	25	Milton, Millsboro
	S-3	Milton to Rehoboth Bay	SR 5 and SR 23	18	Milton, Rehoboth Bay
	S-4	MD Border to Georgetown	SR 18 to US113	20	Bridgeville, Georgetown
	S-5	MD Border to Millsboro via Seaford and Blades	SR 30 to US113/SR 24/SR 30. Follows SR 24 to SR 1	37	Seaford, Blades, Millsboro, Resort Area Outlet Malls
	S-6	Laurel to Lewes	US 9 from Laurel to Lewes	29	Laurel, Georgetown, Lewes
	S-7	MD Border to Bethany Beach	SR 24 to SR 26. Follows SR 26 to US 1.	37	Laurel, Millville, Dagsboro, Ocean View, Bethany Beach
	S-8	Dagsboro to west of Fenwick Island	SR 20/SR 26 to SR 20/SR 54	9	Dagsboro, Keen-wik, Fenwick Island
	S-9	SR30/US13 to Fenwick Island	US 13/SR 30 to SR 54/SR 26, SR 54 to US 1	30	Selbyville, Bunting, Williamsville Cypress Swamp, Keen-wik, Fenwick Island

## 5.0 ROLES FOR PLAN IMPLEMENTATION

A statewide bicycle route network represents a significant investment in Delaware's transportation infrastructure. As with all transportation investments, the bicycle network cannot be created overnight, and it will require a long-term commitment in order for it to be developed and maintained. This section explains how the Bicycle Facility Master Plan will be implemented.

### 5.1 ROLE OF DELDOT

#### 5.1.1 Integration into DelDOT Activities

The key to implementing the Bicycle Facility Master Plan will be to integrate its recommendations into the regular cycle of roadway planning, design, construction, and maintenance.

- **Planning.** Staff awareness of designated bicycle routes means that they can begin to evaluate bicycle facilities early in a road project, when there is time to consider the impacts of such facilities on the design and right-of-way requirements.

Designation of a network of bicycle routes will also improve developer awareness. By clarifying the facility improvements required for each bicycle route, DelDOT will be able to provide developers with important information affecting their property.

- **Design.** The DelDOT *Road Design Manual* notes that the selection of a facility type should be determined in part by the presence of state and local bicycle master plans. This Facility Plan fulfills that role. Therefore, where a roadway project occurs along a route designated by the Bicycle Facility Master Plan, the project team should apply a higher design standard than would be applied to an undesignated bikeway.

Where the design guidelines cannot be met, a design waiver would be sought. (See Chapter 7)

- **Construction.** Interviews with DelDOT Transportation Solutions Construction staff revealed that the ability to implement bicycle facilities properly is contingent on the design plans. By making Construction staff aware of the designated bikeways in the Bicycle Facility Master Plan, they should have a better understanding of the significance of site-specific bicycle improvements. This, in turn, should assist them when it is necessary to modify designs to adapt to conditions in the field.
- **Maintenance.** The Facility Plan does not make any specific recommendations on DelDOT's current on-going maintenance practices. However, the DelDOT *Road Design Manual* does provide guidance on pavement treatments (especially regarding the transitions between the travel lane, shoulder, and gutter pan) which should be taken into consideration during repaving projects to improve bicycling conditions.

### 5.1.2 Identification and Prioritization of Stand Alone Projects

While the majority of the Facility Plan will be implemented as part of regular roadway construction and maintenance projects, it is envisioned that there will still be a desire for “stand alone” bicycle projects. These would be projects that address specific bicycle facility needs. It is therefore necessary to have a prioritization process for these projects. Should funding for them become available the prioritization methodology described in Chapter 6 would be used to determine priorities. Factors to be considered in prioritizing projects will be:

- **Presence of existing projects.** Projects which were initiated prior to the adoption of this Facility plan would not have taken into account the new, designated bicycle routes. If a roadway project is currently in the planning stages but has not specifically included bicycle facilities, it may be appropriate to re-evaluate it for bicycle improvements.
- **Safety issues.** DelDOT maintains data on all roadway accidents and those involving bicycles can be identified. The data on bicycle involved accidents would be used to identify areas with high rates of bicycle accidents.
- **Proximity to schools.** Segments of bicycle routes which are within 1 mile of schools should be given priority. The intent would be to improve conditions for Type “C” (children) bicyclists.
- **Proximity to employers promoting bicycling.** TMA Delaware, the Transportation Management Association for the state, maintains a list of employers who support bicycling. Segments of bicycle routes which fall within 1 mile of these employers should be given priority to support their efforts.
- **Location within State Strategy Investment Areas.** The Delaware Strategies for State Policies and Spending have designated urbanized areas of the state as Level 1 Investment Areas. Alternative modes of transportation are to be targeted in these areas. (bicycling, walking, and transit.) Therefore, portions of bicycle routes which fall within these areas should be given priority.

### 5.1.3 Funding Facility Improvements

Where on-road bikeways can be accommodated within the existing roadway right of way, the cost of signage, striping, and other improvements should be minimal. There will still be costs associated with implementing the Facility Plan, especially where roadways may need to be modified to significantly improve cycling conditions such as on bridges and interchanges. There are a number of funding sources available for bicycle improvements.

**Federal transportation funds:** Bicycle projects are broadly eligible for funding from a large number of federal highway, transit, safety, and other programs. Bicycle projects funded through federal transportation programs must be "principally for transportation, rather than recreation, purposes" and must be designed and located pursuant to the transportation plans required of states and Metropolitan Planning Organizations (MPO). As the routes designated by the Bicycle Facility Master Plan all meet these criteria, they may be eligible for funding from federal sources. Table 5.1 lists potential sources of

federal funding for bicycle programs. Table 5.2 shows how federal funding sources may be applied to specific bicycle facility improvements.

In general, and with a few exceptions, the federal share of the costs for transportation projects is 80 percent with a 20 percent state or local match.

It should be noted that, as of this writing, the federal government has yet to reauthorize the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21). Reauthorization of this act may affect some or all of the programs listed below.

**Transportation Enhancement funds:** DelDOT has a Transportation Enhancement (TE) program which builds off of the federally-funded program. DelDOT's TE program has been used extensively to implement "stand alone" bicycle improvements throughout the state. Projects up to \$1,000,000 are eligible for funding under this program, provided that the sponsors (local or private) are able to match 20% of the funds. (For every \$100,000 less than \$1,000,000, the sponsor's required match decreases by 2 %.)

**Developer easements and in-kind donations:** Developers with projects adjoining designated bikeways may be able to provide an alternative funding source for bicycle facility improvements. For example, developers may be requested to provide right-of-way for bikeways fronting their properties. Alternatively, developments which include shared use trails may be requested to provide trailheads connecting to on-street bikeways. Coordination between DelDOT and developers may provide other opportunities for improving on-street bicycle facilities while sharing costs between DelDOT, developers, and local municipalities.



**Table 5.1. Description of Federal Funding Programs Available for Bicycle Facilities**

<b>Name of Program</b>	<b>Citation</b>	<b>Description</b>
National Highway System Funds	23 USC Section 217 (b)	National Highway System funds may be used to construct bicycle transportation facilities and pedestrian walkways on land adjacent to any highway on the National Highway System, including Interstate highways.
Surface Transportation Program (STP)	23 USC Section 217 (a)	Surface Transportation Program (STP) funds may be used for either the construction of bicycle transportation facilities or non-construction projects (such as maps, brochures, and public service announcements) related to safe bicycle use.
	23 USC Section 152	Each state is required to implement a Hazard Elimination Program to identify and correct locations which may constitute a danger to motorists, bicyclists, and pedestrians. Funds may be used for activities including a survey of hazardous locations and for projects on any publicly owned bicycle or pedestrian pathway or trail, or any safety-related traffic calming measure. Improvements to railway-highway crossings "shall take into account bicycle safety." Ten percent of each state's STP funding is set-aside for the Hazard Elimination and Railway-Highway Crossing programs, which address bicycle and pedestrian safety issues.
Transportation Enhancement Activities (TEAs)	23 USC Section 109 (a) (35)	This law provides a specific list of activities that are eligible Transportation Enhancement activities and this includes "provision of facilities for pedestrians and bicycles, provision of safety and educational activities for pedestrians and bicyclists," and the "preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian and bicycle trails)." Ten percent of each state's annual STP funds are set-aside for Transportation Enhancement activities.
Congestion Mitigation and Air Quality Improvement Program (CMAQ)	23 USC Section 217 (a)	This program was established to assist areas which are considered non-attainment areas as designated by the Clean Air Act. Funds may be used for either the construction of bicycle transportation facilities and pedestrian walkways, or non-construction projects (such as maps, brochures, and public service announcements) related to safe bicycle use. (As of April 2004, all three counties were classified as being in moderate non-attainment of the 8-hour ozone standard.)
Federal Lands Highway Program	23 USC Section 204	Provisions for pedestrians and bicyclists are eligible under the various categories of the Federal Lands Highway Program in conjunction with roads, highways, and parkways. Priority for funding projects is determined by the appropriate Federal Land Agency or Tribal government.

<b>Name of Program</b>	<b>Citation</b>	<b>Description</b>
National Scenic Byways Program	23 USC Section 162 (c) (4)	This program recognizes "roads having outstanding scenic, historic, cultural, natural, recreational and archaeological qualities by designating them as National Scenic Byways or All-American Roads." Funds from this program may be used for "construction along a scenic byway of a facility for pedestrians and bicyclists."
Highway Bridge Replacement and Rehabilitation Program	23 U.S.C. Section 217	Under this program, provisions for bicycle crossings may be made on a bridge deck which is being rehabilitated or replaced, provided that (a) bicyclists are permitted to operate at either end of the bridge; and, (b) such provisions may be made at a reasonable cost.
Highway Safety Research and Development Program	23 USC Section 403	This program funds research, development, demonstrations and training to improve highway safety (including bicycle safety.)
Transportation and Community and System Preservation Pilot Program	TEA-21 Section 1221	This program is designed to support projects which seek to integrate transportation planning and community development to create communities with a higher quality of life. Bicycle plans and facilities may be funded through this program.
Job Access and Reverse Commute Grants	TEA-21 Section 3037	The purpose of this program is to improve opportunities for commuters trying to reach suburban job sites from urban locations. Job Access and Reverse Commute Grants are available to support projects, including bicycle-related services, designed to transport welfare recipients and eligible low-income individuals to and from employment.
23 USC Section 206	Recreational Trails Program	Funds may be used for all kinds of trail projects, including trailheads which intersect on-street bikeways. Of the funds apportioned to a state, 30 percent must be used for motorized trail uses, 30 percent for non-motorized trail uses, and 40 percent for diverse trail uses (any combination).
Federal Transit Capital, Urban, and Rural Funds	Title 49 U.S.C. Section 5307	Urbanized Area Formula Grants, Capital Investment Grants and Loans, and Formula Program for Other than Urbanized Area transit funds may be used for improving bicycle access to transit facilities and vehicles. Eligible activities include investments in "bicycle access to a mass transportation facility" that establishes or enhances coordination between mass transportation and other transportation.

**Table 5.2. Bicycle Facilities Eligible for Federal Funding**

	NHS	STP	HEP	RHC	TEA	CMAQ	RTP	FTA	BRI	TCSP	JOBS	FLH	BYW
Bicycle and pedestrian plan		*				*				*			
Bicycle lanes on roadway	*	*	*	*	*	*		*	*			*	*
Paved Shoulders	*	*	*	*	*	*			*			*	*
Signed bike route	*	*			*	*						*	*
Spot improvement program		*	*		*	*							
Bike racks on buses		*			*	*		*					
Bicycle parking facilities		*			*	*		*					*
Trail/highway intersection	*	*	*		*	*	*					*	*
Bicycle storage/service center		*			*	*		*		*	*		
Signal improvements	*	*	*	*	*	*							
Traffic calming		*	*	*	*	*				*			
KEY													
NHS	National Highway System			BRI	Bridge								
STP	Surface Transportation Program			402	State and Community Traffic Safety Program								
HEP	Hazard Elimination Program			PLA	State/Metropolitan Planning Funds								
RHC	Railway-Highway Crossing Program			TCSP	Transportation and Community and System Preservation Pilot Program								
TEA	Transportation Enhancement Activities			JOBS	Access to Jobs/Reverse Commute Program								
CMAQ	Congestion Mitigation/Air Quality Program			RTP	Recreational Trails Program								
FLH	Federal Lands Highways Program			FTA	Federal Transit Capital, Urban & Rural Funds								
BYW	Scenic Byways												
Source: FHWA Guidance - (February 24, 1999) Bicycle and Pedestrian Provisions of Federal Transportation Legislation. <a href="http://www.fhwa.dot.gov/environment/bikeped/BP-Guid.htm#bpApp-2">http://www.fhwa.dot.gov/environment/bikeped/BP-Guid.htm#bpApp-2</a>													

### 5.1.4 Design Guideline Waivers

The design guidelines proposed for Statewide Bicycle Routes, Regional Bicycle Routes, and Recreational Connectors can be accommodated within the recommended right-of-way for new roadways and roadway reconstruction; however, there may be instances where local conditions would make the application of these standards difficult, if not impossible, or where provision of facilities may need to be staged over a period of time. In such instances, a design waiver from the guidelines is required.

Chapter 7 provides further guidance on the waiver process.

## 5.2 ROLE OF OTHER STAKEHOLDERS

While the Facility Plan deals primarily with bikeways on the DelDOT road network, discussions with municipalities and other state agencies indicated that they will have a

significant role in implementing the Facility Master. The role of these stakeholders is described in the below.

### **5.2.1 Municipalities**

Several municipalities within Delaware have developed their own bicycle facilities, including both on-road bicycle routes, referred to in this plan as Feeder Routes, and off-road trails and greenways. The Facility Plan will supplement and enhance these Feeder Routes by connecting them to a larger network of bikeways.

It is envisioned that municipalities will be able to support the Facility Plan by designating new routes within their communities which tie into the statewide bicycle network. Municipalities may also designate connections between Feeder Routes and Statewide Bicycle Routes and Regional Bicycle Routes.

Local jurisdictions should also support the plan by making DelDOT aware of local constraints which should be addressed during implementation of the Facility Plan. They may also identify connections which may be made to Statewide and Regional Bicycle routes through DelDOT's Transportation Enhancement program.

### **5.2.2 Delaware Department of Natural Resources and Environmental Control (DNREC)**

As the caretaker of Delaware's parks, wildlife refuges, and natural areas, DNREC is responsible for the majority of the shared-use trails in the State of Delaware. Coordination between DNREC and DelDOT will ensure that appropriate connections are made between recreational trails and the Statewide Bicycle Routes, Regional Bicycle Routes, and Recreational Connectors of the Facility Plan.

The Council on Greenways and Trails serves to advise the DNREC Secretary on the development of greenways and trails. DelDOT is represented on this Council. As the Council receives feedback from cycling groups throughout the state, DelDOT's continued participation in the Council may provide additional feedback on cycling conditions in Delaware.

### **5.2.3 Delaware Bicycle Council**

The stated role of the Delaware Bicycle Council is to advise state agencies regarding bicycle issues. DelDOT is represented on the Council, and will keep its members informed of the progress being made in implementing the Facility Plan. As the Delaware Bicycle Council receives feedback from bicycle groups around the state, it will be able to advise DelDOT on issues associated with on-road bikeways and their associated facilities.

### **5.2.4 Metropolitan Planning Organizations (MPOs)**

The two Metropolitan Planning Organizations located in Delaware are WILMAPCO and the Dover-Kent MPO. Both of these agencies conduct area and corridor studies regarding pedestrian and bicycle needs. In addition, WILMAPCO maintains a Non-motorized Working Group to advise WILMAPCO on pedestrian and bicycle issues

associated with its Long Range Transportation Plan and Transportation Improvement Program (TIP).

Both MPOs are responsible for reviewing projects proposed for the Transportation Improvement Program. The Bicycle Facility Master Plan will assist the MPOs by letting them know where on-road bikeways have been designated and need to be included as part of TIP projects.

### **5.2.5 Delaware State Police Department**

The State Police Department is responsible for documenting bicycle accidents on Delaware's roadways. This information is critical to identifying high accident areas which may need bicycle facility improvements. Highway accident data has typically been focused towards motorized traffic, but there are bicycle accidents trends which can be evaluated with the current data. For example, bicyclists have expressed concerns about "doorings"—collisions where bicycles run into the open door of a parked car. Current data collected by the State Police Department does not provide enough detail to identify that type of incident or to assess the frequency with which it occurs.

DelDOT will coordinate with the State Police Department to ensure that bicycle accident records are maintained and updated in a format suitable for identifying and addressing accident trends. Accident data provided by the State Police Department will be used to calculate accident rates on bikeways and to evaluate the effectiveness of facility improvements on bicycle safety.

### **5.2.6 Delaware Transit Corporation**

The Delaware Transit Corporation (DTC) currently has two programs which facilitate inter-modal connections between bicycles and transit. First, DTC provides bicycle lockers and bicycle racks at park and ride facilities and rail stations. Second, some DTC buses are equipped with bicycle racks, allowing transit patrons to ride their bicycles at both ends of their journey.

By designating a network of on-street bicycle routes, the Facility Plan should help the DTC determine which of their transit stations should be equipped with bicycle storage facilities. Coordination with DTC will also make it possible to identify, fund, and implement improved bicycle connections to transit stations.

It is recommended that DTC provide bicycle racks on more of its bus fleet, especially in New Castle County. This would be of great utility to less experienced cyclists, who may use transit to bypass areas with more challenging cycling conditions (e.g. urbanized areas, roadways with heavy traffic, major bridges, etc.)

### **5.2.7 Office of Highway Safety and Homeland Security**

The mission of the Office of Highway Safety and Homeland Security (OHS) is to reduce death and injury on highways in Delaware. OHS is concerned with the human behavior side of safety and conducts and funds programs to improve safety. Regular coordination with OHS will provide DelDOT with feedback regarding the effectiveness of the bicycle facility improvements being implemented. As OHS frequently receives comments and suggestions from elected officials and the general public, they may be able to pass this

information along to DelDOT so it may be incorporated into updates of the Bicycle Facility Master Plan.

### **5.2.8 Department of Education**

The Department of Education is currently working with DelDOT to implement the Delaware Safe Routes to School (SR2S) Pilot Project. As part of this project, DelDOT, the Department of Education, and members of the Safe Routes Committee will select six pilot school sites where SR2S programs will be implemented. Grants of \$10,000 to \$15,000 will be provided to pilot schools for Safe Routes activities (community meetings, etc.) and physical improvements.

DelDOT will also coordinate with the Department of Education to ensure it is aware of all existing and proposed schools served by Statewide Bicycle Routes, Regional Bicycle Routes, and Recreational Connectors. The presence of schools will be one consideration when prioritizing immediate facility needs along DelDOT-maintained bikeways.

## 6.0 IMPLEMENTATION OF PRIORITIZATION PROCESS

The Bicycle Facility Master Plan recommends that bicycle facility improvements are implemented as part of regular roadway construction and maintenance activities, allowing the network to develop as part of an incremental, multimodal approach to transportation infrastructure. However, there may be times where funds become available for “stand alone” bicycle projects to address immediate and short-term facility needs. The following methodology is designed to prioritize such projects. Once implemented, this prioritization process will provide DelDOT with a list of areas along the planned bicycle network which should be implemented as resources are available.

### 6.1 OVERALL APPROACH

The objective of this prioritization process is to identify specific bicycle facility needs (roadway segment or intersections) along Statewide and Regional Bicycle Routes. As the majority of the information used in the methodology described below is available in electronic format, a prioritization can be performed in a Geographic Information System (GIS.) Data on each of the criteria can be overlain on a geographic base map to help identify the locations having highest priority. This approach will reduce the labor necessary to perform the evaluation and ensure that the methodology is being applied in a consistent manner.

GIS files have been created for both the Statewide Bicycle Routes and the Regional Bicycle Routes. Each set of files consists of two elements:

- a graphic file (“shapefile”) which displays the map of the routes; and,
- a database file which stores each route segment as a separate row of information.

The shapefiles of the routes will be brought into a GIS and superimposed over shapefiles of other variables. The map generated by the GIS will identify which route segments match the criteria (i.e. are within 1 mile of schools, fall within a CTP project area, etc.) The database files for the routes will be updated using this information. The end result will be a table which can then be sorted to create a prioritized list of route segments eligible for bicycle facility improvements.

Table 6.1 lists the information necessary to complete the prioritization. It also describes the general steps used to analyze the route segments.

### 6.2 EVALUATION CRITERIA

The evaluation criteria to be used in the prioritization process are listed below in order of highest to lowest priority:

- Existence of CTP projects and/or programs. DelDOT currently maintains a database of all projects in the Capital Transportation Program (CTP). *Bicycle route segments which occur within the limits of projects currently in Planning and Development phase (PD) of the CTP will be identified.* (It is assumed that modifying projects that are currently in the CTP and are beyond the PD phase would adversely impact the overall project budget or schedule.)

**Table 6.1. List of data necessary for prioritization.**

<b>Data</b>	<b>Format</b>	<b>Source</b>	<b>Processing Required</b>
Capital Transportation Program projects	Database and GIS layer	DelDOT	Superimpose route shapefiles over CTP shapefile; identify those route segments which fall within project boundaries of CTP projects in planning and development (PD) phase.
Bicycle accident data	Database and GIS layer	DelDOT Delaware State Police Department	Superimpose route shapefiles over accident shapefile; use GIS to count the number of bicycle accidents along each route segment.
Public schools	GIS layer	Department of Education	Use GIS to identify those route segments within 1 mile of public schools, colleges, and universities.
Employers supporting bicycling	List of employer addresses	TMA Delaware	Code list of employers into a shapefile; use GIS to identify those route segments within 1 mile of employers.
State Strategy Investment Areas	GIS layer	Delaware Office of State Planning Coordination	Superimpose route shapefiles over shapefile of State Strategy Investment Areas; identify those route segments within Level 1 Investment Areas.

- Safety issues. DelDOT currently maintains a database of all bicycle-related accidents. The number of accidents will be calculated for each bicycle route segment. The bicycle accident data will be linked to the GIS layer for the Statewide and Regional route segments. *Route segments with an above average number of accidents will be identified.*
- Proximity to schools. The Delaware Department of Education maintains data on all public schools in the state. *Bicycle route segments that are within 1 mile of these schools will be identified, as will route segments within 1 mile of colleges and universities.* (Kindergartens and Pre-K facilities will be excluded from this analysis.)
- Proximity to employers promoting bicycling. TMA Delaware maintains a list of employers who support bicycling. This list includes some of the largest employers in the state; it is assumed that bicycle routes serving their employment sites would be used more regularly than routes located elsewhere throughout the network. *Bicycle routes within 1 mile of these employers will be identified.*
- Location within State Strategy Investment Areas. The Delaware Office of State Planning maintains a GIS layer of the State Strategy Investment Areas, described in the *Living Delaware Strategies for State Policies and Spending (State Strategies.)* Level 1 Investment Areas have been identified as places where the state should target investments in alternative modes of transportation (i.e. bicycling, walking, and transit.) The investment levels for each segment will be



identified. *Those route segments falling within Level 1 Investment Areas will be considered to have priority over route segments in other portions of the state.*

### 6.3 HIGHEST PRIORITIES

Each route segment record will be coded to indicate whether it meets any or all of the criteria above. The route segments will then be sorted by these criteria in the order presented above to identify the segments that are highest priority based on meeting the most criteria. A hypothetical example of an end product is provided in Table 6.2.

**Table 6.2. Example of prioritization.**

Route Segment	CTP Project	# of Accidents	Schools?	Employers?	State Strategies
F	Yes	1	No	No	1
D	No	3	Yes	Yes	
E	No	2	Yes	No	1
A	No	1	Yes	No	
B	No	0	Yes	No	
C	No	0	Yes	No	
G	No	0	No	No	

Since the majority of the routes run through rural areas (and are therefore, further away from schools, major employers, and Level 1 Investment Areas), route segments identified as candidates for stand-alone projects are likely to account for only a small proportion of the total route mileage.

Route segments identified as priority candidates for improvements would then be reviewed by DelDOT staff to determine what specific improvements should be made. In addition, it is assumed that DelDOT staff responsible for implementation of the bicycle network would identify potential funding opportunities for the facilities such as:

- Transportation Enhancements Program
- Rail Crossing Safety
- Safety Improvement Program
- Bridge Preservation Program
- Paving Program, Surface Treatment, and Surface Treatment Conversion
- Traffic Calming Program

## **7.0 IMPLEMENTATION OF A WAIVER**

### **7.1 PURPOSE**

The intent of the Bicycle Facility Master Plan is to designate a statewide network of on-road bikeways on which a higher level of facility will be provided. In order for the network to be successful, it is important that the designated bike routes are held to the intended design guidelines when compared to other undesignated bikeways. However, it is recognized that instances may arise where it is not possible to meet the design guidelines of the Bicycle Facility Master Plan. Where constraints occur, or where the timing for full implementation does not make sense, DelDOT planning and design staff will work together to propose mitigation that allows for bicycle connectivity, or phased implementation, rather than elimination of the bike facility from the overall transportation project.

The need for a waiver on a project may be identified by either planning or design staff. If design staff cannot meet the guidelines established by this plan, then a waiver should be sought. Additionally, DelDOT planning staff may seek a waiver on projects where for continuity and connectivity reasons, it makes sense to defer inclusion of some aspect of the bicycle facility, until certain circumstances exist.

For example, this Facility Plan establishes minimum bikeway widths that in some cases exceed the minimum standards of the DelDOT *Road Design Manual* and the AASHTO *Guide for the Development of Bicycle Facilities*. Where the Facility Plan recommendation cannot be met, it will be necessary for the Project Engineer to seek a waiver from the design guidelines. As well, if an initial section of a roadway project includes bicycle facility improvements, it may be appropriate to defer some features such as route signage or markings until further portions of the route are completed. This section documents the procedure for obtaining approval for a waiver.

### **7.2 DETERMINING FACTORS**

Efforts are to be made to comply with the Bicycle Plan design guidelines, however, if they cannot be met, the justification to seek a waiver will need to be prepared by the DelDOT Project Engineer or Planning Staff. The first step is to prepare written documentation of the project and the setting in which the waiver is sought. The documentation should explain:

- Existing roadway characteristics including the planned or existing bike route characteristics connecting to the project
- Information on the implementation status of Bike Route affected
- Cross section comparing existing and proposed conditions;
- Analysis of bicycle accident records for the roadway affected
- Effect on right-of-way;
- Environmental constraints;

- Other pertinent factors; including reasons for deferral of facility improvements

### **7.3 MITIGATION PLAN**

Where the design guidelines of the Bicycle Facility Master Plan cannot be met, DelDOT Staff must still provide bicycle facility improvements to ensure that the designated bicycle route will provide a benefit over parallel routes in the same corridor. Information on the proposed alternative facility improvement for the area of the waiver must be provided. (e.g.: Is a narrower bike route proposed for a brief segment due to constraints?)

The second step is to submit a mitigation plan to support the proposed request for a Design Waiver. The mitigation plan must explain what will be done to improve bicycling conditions in lieu of meeting the Facility Plan design guideline for the on- road bicycle route that is planned. A mitigation plan may include actions such as:

- Use of a wide outside travel lane where a preferential bike lane cannot be accommodated
- Additional warning signage as a caution for a constrained area such as a bridge or interchange area
- On-street parking restrictions- to provide width needed for bicycle facility
- Creation or improvement of parallel off-road facility connected to the on-road bicycle route where no on-road design can be accommodated.

The third step is to submit the application for waiver and proposed mitigation plan to the DelDOT Bicycle and Pedestrian Coordinator for his/her reviews and input. Any comments from the Bicycle and Pedestrian Coordinator on the waiver and the mitigation plan are to be considered by the requestor.

When the waiver requestor and the Bike /Pedestrian Coordinator are in agreement, the waiver and mitigation plan are to become project documentation for design.

If needed, a fourth step applies when there is not agreement regarding the need for the waiver or the proposed mitigation then the documentation for the waiver and proposed mitigation plan with comments. The documentation for the waiver and the mitigation plan with Coordinator comments are to be submitted to the Director of Planning and the Chief Engineer for resolution.

If concurrence cannot be reached by the Director and Chief Engineer, then the matter is to be referred to the Secretary of Transportation for final disposition.



# Appendix A: Design Recommendations





## **APPENDIX A: DESIGN RECOMMENDATIONS**

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## APPENDIX A

### A.1 PURPOSE OF APPENDIX

The purpose of this Appendix to the Bicycle Facilities Master Plan is to provide DelDOT planners, engineers, and construction managers with guidance as to how on-road bike routes should be treated. The recommended treatments for designated bicycle routes are provided and the hierarchy for the overall bicycle facility network is defined. The recommendations provided herein are based on guidance found in the *AASHTO Guide for the Development of Bicycle Facilities* and the *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities*. Supplemental guidance was taken from the *Oregon Pedestrian and Bicycle Plan*, and the *Wisconsin Bicycle Facility Design Handbook*.

### A.2 BICYCLE NETWORK

#### A.2.1 Purpose of Facility Plan

The majority of roadways in Delaware function as bikeways and should be developed and maintained to support bicycling. The Bicycle Facilities Master Plan recognizes a subset of Delaware's roadways as part of an overall network of bicycle routes on which to provide priority treatments. The components of the network are described below. This Plan provides route and design recommendations for Statewide, Regional, and Recreational Connector routes. By designating a smaller network of bicycle routes, the State will be able to focus resources on a limited set of roadway facilities and promote bicycling as a way to meet local, regional, and statewide mobility needs.

#### A.2.2 Definition of Routes

The overall bicycle network has a five-tiered hierarchy:

- **Statewide Bicycle Routes**, which improve bicycling conditions between counties and provide connections to Pennsylvania and Maryland;
- **Regional Bicycle Routes**, which are designed to serve utilitarian bicycling trips (shopping, commuting) to municipalities and major activity centers;
- **Recreational Connectors**, which provide connections to local parks, trails, and other recreational activities;
- **Feeder Routes**, those routes which are not part of the formal on-road bicycle network maintained by DelDOT. They are the on-road and off-road facilities maintained by municipalities and other agencies; and,
- **Undesignated Bikeways**, which are not designated as bike routes, but on which bicycling is permitted.

Descriptions of the specific Statewide and Regional Bike Routes included in the network can be found in Appendix B of the Facility Plan.

## A.3 BIKEWAYS

### A.3.1 Definition

The Delaware Bicycle Policy defines a bikeway as “any road, street, path or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are to be shared with other transportation modes.” Since the Delaware Code 17, Section 1006 specifies that bicycles may be operated on all roads by signed controlled-access highways, it is clear that the majority of Delaware’s roadways function as bikeways, regardless of whether or not they are part of a designated route.

The Bicycle Facility Master Plan defines three types of bikeways:

- **Bike Lane.** Design guidelines include 5 feet minimum lane width with striping, bike symbols, and route designation. Warning and regulatory signage shall be provided. The guidelines for Bike Lanes establish preferential use by bicyclists.
- **Shared Shoulders.** The paved shoulder should be a minimum of 5 feet wide. Includes some signage and bicycle symbols. This bicycle facility is intended to be shared by bicyclist and motorists. A shared bikeway maintains emergency use of the shoulder for motorist breakdowns/emergencies while providing a facility for bicyclists separated from the travel lane. Parking on shoulders should be prohibited.
- **Wide Outside Travel Lane.** The guidelines include a 14 foot wide outside travel lane to be shared by motorists and bicyclists. Warning and regulatory signage may be included but no striping shall be provided.

### A.3.2 Application to Bicycle Routes

For each type of designated bicycle route, defined in Section A.2.2, there are required and preferred bicycle facility features which should be installed to ensure a uniform path of travel along the bicycle route. Table A.1 illustrates the type of bikeway facility features required and preferred for each type of bicycle route.

In satisfying the required elements of Table A.1, Statewide, Regional, and Recreational Connectors bicycle routes can be built as bike lanes, shared shoulders, or wide outside travel lanes as determined by DelDOT staff.

The plan guidelines and considerations included in Table A.2 should be evaluated when selecting the appropriate bikeway to be installed for a designated bicycle route.

**Table A.1. Summary of Bicycle Facility Recommendations**

	Type of Bicycle Routes	Statewide Bicycle Route	Regional Bicycle Route	Recreational Connector
R-Required P- Preferred				
<b>Minimum Facility Width</b>		5'	5'	5'
<b>Facility Improvements</b>				
Bike Route Number Signs		R	R	n/a
Warning & Regulatory Signs		R	R	R
Bicycle Symbols		R	R	P
Bicycle Friendly Drainage Grates		R	R	R
Right angles railroad crossings		R	R	R
Utility Covers out of path or flush		R	R	R

**Table A.2. Bikeway Types included in Bicycle Facility Master Plan**

Type of Bikeway	Plan Guidelines	Considerations
Bike Lane	5' wide lanes with striping, bike symbols route designation, warning and regulatory signage to establish preferential use by bicyclists;	Most beneficial type of facility for less experienced riders (Group C) but difficult to fit within existing roadways. Best for roadways with on-street parking.
Shared Shoulder	Paved shoulder at least 5' wide. Includes some signage and bike symbols. Establishes intent for shoulder to be shared by bicyclists and motorists	This type of facility is suitable for basic bicyclists. A shared signed bikeway maintains emergency use of shoulder for motorist breakdowns/emergencies while providing a facility for bicyclists separated from the travel lane. Parking on shoulders to be prohibited.

Wide Outside Travel Lane	14' wide outside traffic lane to be shared by motorists and bicyclists. Warning and regulatory signs included but no striping provided.	Most applicable type of bikeway for roadways with low speeds and lower traffic volumes; intended for more advanced bicyclists
--------------------------	---	---

### A.3.3 Bikeway Standards

#### A.3.3.1 Minimum Bikeway Lane Widths

This Plan establishes a minimum width for Bike Lanes and the shared shoulders as five feet (4 foot minimum width if no curb is present, i.e. rural system roadways). This width can be accommodated within most of the cross section widths shown in the DelDOT *Road Design Manual* for most new construction and 4-R Improvements (Resurfacing, Restoring, Rehabilitating, and Reconstruction).

The routes designated by the Facilities Plan are part of a network of bikeways providing connectivity between activity centers throughout the State of Delaware. Their significance to regional and statewide bicycle mobility warrants preferential treatment over bikeways which are not designated as Statewide Bicycle Routes, Regional Bicycle Routes, or Recreational Connectors. Additional width may be appropriate on roads with a steep grade or high volumes of traffic.

Where it is determined that bicycle and vehicular traffic will be accommodated in a general travel lane, the outside travel lane should be a minimum of 14' wide. Additional lane width may be appropriate along road segments with high volumes of traffic and/or posted speeds of greater than 30 mph. Figure A.1 illustrates cross-sections that include bicycle facilities.

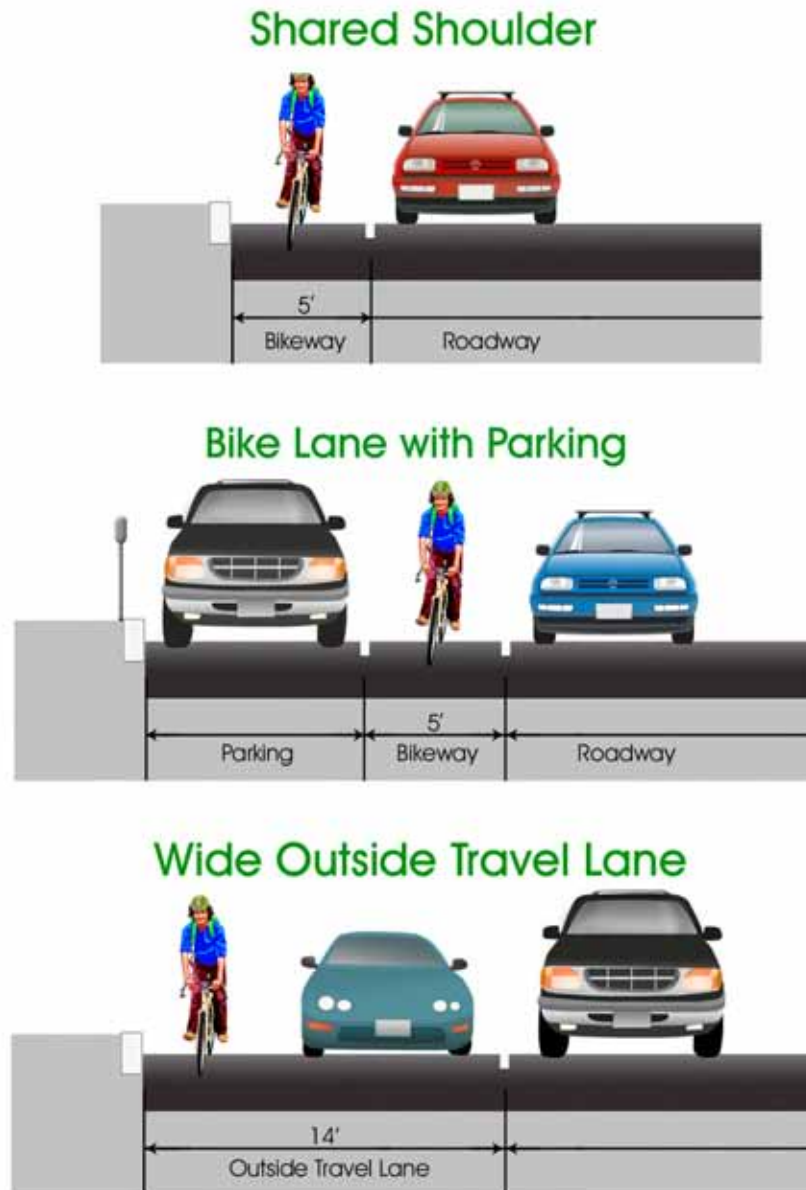
#### A.3.3.2 Treatment of On-Street Parking

When implemented on roadways with on-street parking, bikeways should be to the left of the parking lane. Bikeways should never be put between the parking lane and the curb. Additional guidance on the treatment of bike lanes where on-street parking is present may be found in the DelDOT *Road Design Manual*.

#### A.3.3.3 Other Design Considerations

- Bikeways should provide a continuous stretch of smooth pavement for cyclists. The DelDOT *Road Design Manual* notes that longitudinal drop-offs between the general travel lane, the bikeway pavement, and the gutter pans (where present) should not exceed more than ½ inch. Where rumble strips are used, the ridges used in the strip should not exceed ¾ inch in height.

**Figure A.1. Cross-Sections of Bicycle Facilities**



- The use of chip seal pavement should be discouraged on designated bikeways. Where roadways which are currently paved with chip seal are part of a designated bicycle route, alternative pavement treatments should be considered when they are scheduled for repaving.
- All on-road bikeways should be developed as one-way facilities operating in the same direction as motorized traffic. On one-way roadways, bicycle lanes should be placed on the right-hand side of the roadway.
- Bike Lanes should be striped and signed in accordance with the design guidelines provided in this appendix.

Local conditions may preclude the provision of a bikeway which meets the recommended design guidelines. In such instances:

- A design waiver should be sought. The waiver should explain the circumstances which preclude achieving the minimum design standards for a designated bikeway. The waiver should also propose appropriate mitigation efforts, which should be developed in coordination with the DelDOT Bicycle and Pedestrian Coordinator. Additional guidance on the waiver process may be found in Chapter 7.
- Regardless of the width of the bikeway, the DelDOT project manager will still be required to provide other facility improvements (signage, signalization, etc.) to enhance bicycle mobility along a designated bicycle route to provide better cycling conditions than roadways paralleling the route.

## **A.4 TRAFFIC CONTROLS**

Traffic controls for bikeways may include signage, lane striping, and lane markings. The traffic control recommendations within this plan are based on guidance found in the *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities*. Supplemental guidance was taken from the August 2003 draft of the *Maryland Standard for the Use of Bicycle Symbol Pavement Markings*.

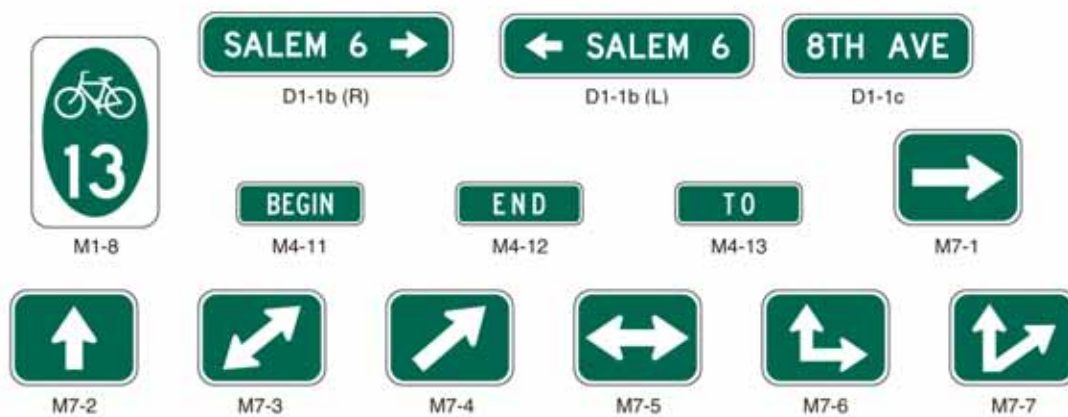
### **A.4.1 Guide Signage**

#### **A.4.1.1 Definition**

Guide signage identifies a route, its endpoints, and major destinations. Figure A.2 illustrates the types of route guide signs.

#### **A.4.1.2 Application to Routes**

Guide signage is appropriate along all Statewide and Regional Bicycle Routes. It may also be applied where Recreational Connectors intersect Statewide and Regional Bicycle Routes to make cyclists aware of other routes in the bicycle network.



**Figure A.2. Guide Signage for Statewide and Regional Routes.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

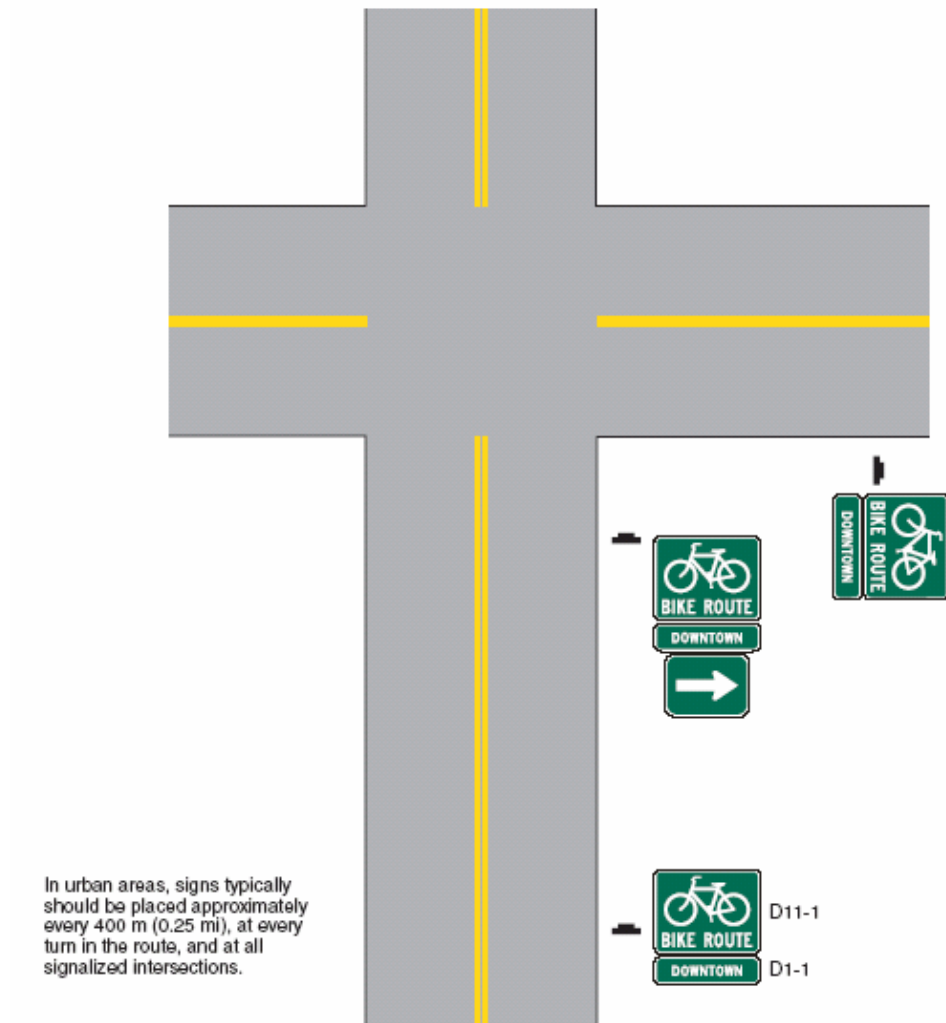
#### A.4.1.3 Placement and Spacing

As noted in the MUTCD, “Bicycle Route signs should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.”<sup>2</sup> In urbanized areas, guide signage should be placed every ¼-mile, at every turn in a route, and at every major intersection.

Figures A.3 and A.4 illustrate examples provided by the MUTCD for the placement of such signage.

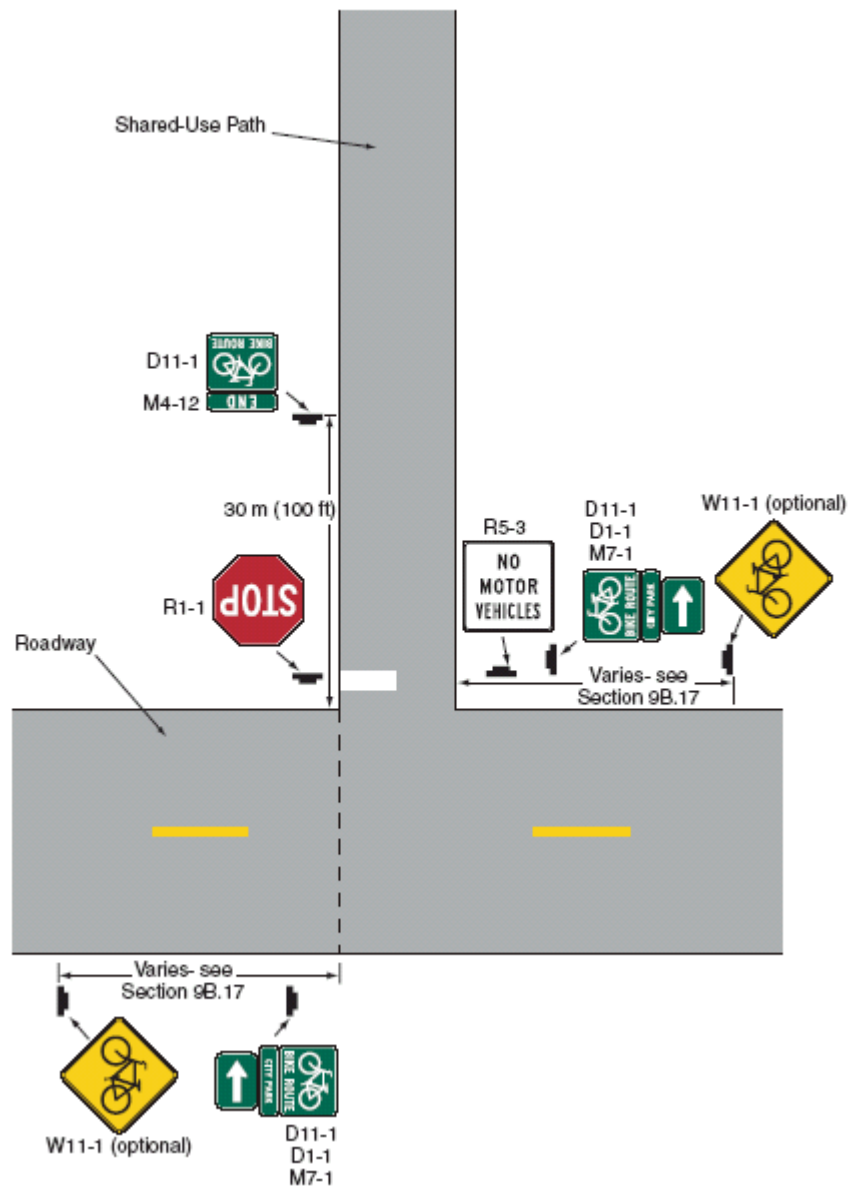
<sup>2</sup> *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities*, p. 9B-10.





**Figure A.3. Example of On-Road placement of Guide Signs.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities*, Figure 9B-6.



**Figure A.4. Example of Guide Signage for Beginning and End of Bicycle Route.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities*, Figure 9B-5.

## A.4.2 Regulatory Signage

### A.4.2.1 Definition

The MUTCD states that “Regulatory signs shall be used to inform road users of selected traffic laws or regulations and indicate the applicability of the legal requirements.” As bicycles must observe the same traffic laws as motorized vehicles, the majority of regulatory signage already on the roadways applies to bicycles, and does not have to be explained further here. The one regulatory sign which applies explicitly to bicycles is R4-4, “Begin Right Turn Lane Yield to Bikes” (see Figure A.5.)



R4-4

**Figure A.5. Begin Right Turn Lane Yield to Bikes.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

### A.4.2.2 Application to Routes

Regulatory signage is appropriate along all types of routes covered by this plan.

### A.4.2.3 Placement and Spacing

Regulatory signage should be placed in accordance with guidance in the MUTCD. The MUTCD table regarding placement and spacing of regulatory signage has been provided in Table A.3.

**Guidelines for Advance Placement of Warning Signs**  
(English Units)

Posted or 85th-Percentile Speed	Advance Placement Distance <sup>1</sup>								
	Condition A: Speed reduction and lane changing in heavy traffic <sup>2</sup>	Condition B: Deceleration to the listed advisory speed (mph) for the condition <sup>4</sup>							
		0 <sup>3</sup>	10	20	30	40	50	60	70
20 mph	225 ft	N/A <sup>5</sup>	N/A <sup>5</sup>	—	—	—	—	—	—
25 mph	325 ft	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	—	—	—	—	—
30 mph	450 ft	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	—	—	—	—	—
35 mph	550 ft	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	—	—	—	—
40 mph	650 ft	125 ft	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	—	—	—	—
45 mph	750 ft	175 ft	125 ft	N/A <sup>5</sup>	N/A <sup>5</sup>	N/A <sup>5</sup>	—	—	—
50 mph	850 ft	250 ft	200 ft	150 ft	100 ft	N/A <sup>5</sup>	—	—	—
55 mph	950 ft	325 ft	275 ft	225 ft	175 ft	100 ft	N/A <sup>5</sup>	—	—
60 mph	1100 ft	400 ft	350 ft	300 ft	250 ft	175 ft	N/A <sup>5</sup>	—	—
65 mph	1200 ft	475 ft	425 ft	400 ft	350 ft	275 ft	175 ft	N/A <sup>5</sup>	—
70 mph	1250 ft	550 ft	525 ft	500 ft	425 ft	350 ft	250 ft	150 ft	—
75 mph	1350 ft	650 ft	625 ft	600 ft	525 ft	450 ft	350 ft	250 ft	100 ft

Notes:

<sup>1</sup> The distances are adjusted for a sign legibility distance of 175 ft for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 ft, which is appropriate for an alignment warning symbol sign.

<sup>2</sup> Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PIEV time of 14.0 to 14.5 seconds for vehicle maneuvers (2001 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 175 ft for the appropriate sign.

<sup>3</sup> Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2001 AASHTO Policy, Stopping Sight Distance, Exhibit 3-1, providing a PIEV time of 2.5 seconds, a deceleration rate of 11.2 ft/second<sup>2</sup>, minus the sign legibility distance of 175 ft.

<sup>4</sup> Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PIEV time, a vehicle deceleration rate of 10 ft/second<sup>2</sup>, minus the sign legibility distance of 250 ft.

<sup>5</sup> No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing to provide an adequate advance warning for the driver.

**Table A.3. Guidelines for Placement of Warning Signs.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 2C, Warning Signs.*

### A.4.3 Warning Signage

#### A.4.3.1 Definition

Warning signage is designed to alert bicyclists and motorists to variations in road conditions which may either (a) constitute a hazard along a bikeway; or, (b) require a bicyclist to transition into the general traffic lane. The following warning signage is appropriate along all bikeways:

- Share the Road. (W11-1, W16-1. See Figure A.6.) These are currently the most common type of bicycle signs used in the State of Delaware. While these signs do raise awareness of bicycle traffic, like any type of warning, overuse tends to lessen their effectiveness. It is recommended that “Share the Road” signage be used only where an area has a history of bicycle accidents or where bicycles may need to move into the general travel lane.



**Figure A.6. Share the Road signage.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

- Bicycles Prohibited. These are required at the entrances to all signed controlled-access highways.
- Bicycle Surface Condition Warnings. (W8-1, W8-2, W8-10, W8-10p, W10-1.) Such signage is appropriate where there are sudden changes in road conditions, i.e. gaps between a road and a bridge deck, dips in the road, etc. (See Figure A.7.)



**Figure A.7. Bicycle Surface Condition Warnings.**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

- **Railroad Crossing (W11-59.3)** This may be used as an alternative to W10-1. Figure A.8 illustrates signage used by the Oregon Department of Transportation for this purpose; MUTCD Sign W11-59.3 is similar and would be appropriate for Delaware bikeways.



**Figure A.8. Railroad Bicycle Crossing Sign OBW8-20.**

Source: *Oregon Pedestrian and Bicycle Plan.*

- **Roadways Narrows (W5-4a.)** This should be used when it is not possible to provide a bikeway at least five-feet wide. (See Figure A.9)



**Figure A.9. Bikeway Narrows Sign**

Source: Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.

#### A.4.3.2 Application to Routes

Warning signage is appropriate along all types of routes covered by this plan. However, along Statewide and Regional Routes, “Share the Road” signage should be limited to locations where bicycles must transition from the bikeway into the general traffic lane. (It is assumed that in all other cases, the presence of bicycle lanes and guide signage will serve as a suitable warning of the presence of bicycle traffic.)

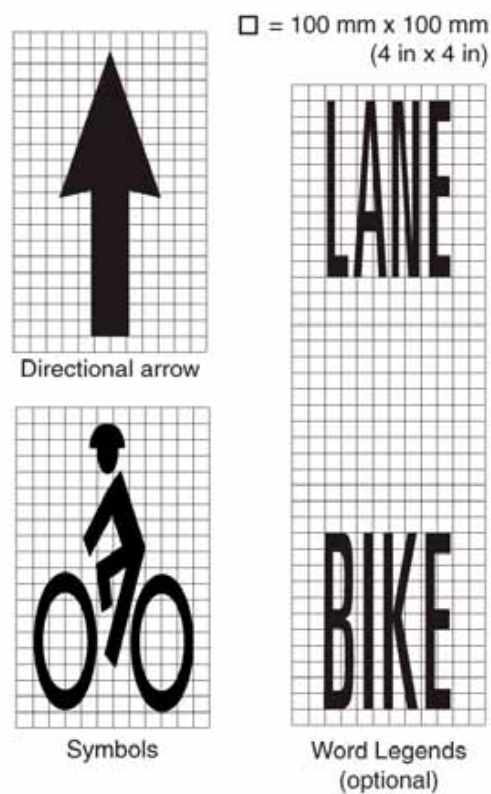
#### A.4.3.3 Placement and Spacing

Warning signage should be placed in accordance with MUTCD guidance referenced in Table A.3.

### A.4.4 Lane Markings and Bike Lane Symbols

#### A.4.4.1 Definition

Lane markings delineate bicycle facilities from general travel lanes, turn lanes, and parking lanes. The MUTCD guidelines state that the purpose lane markings or symbols are “to designate that portion of the roadway for preferential use by bicycles.” Figure A.10 illustrates lane markings and symbols.



**Figure A.10. Typical Bike Lane Symbols**

Source: *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition, Part 9, Traffic Controls for Bicycle Facilities.*

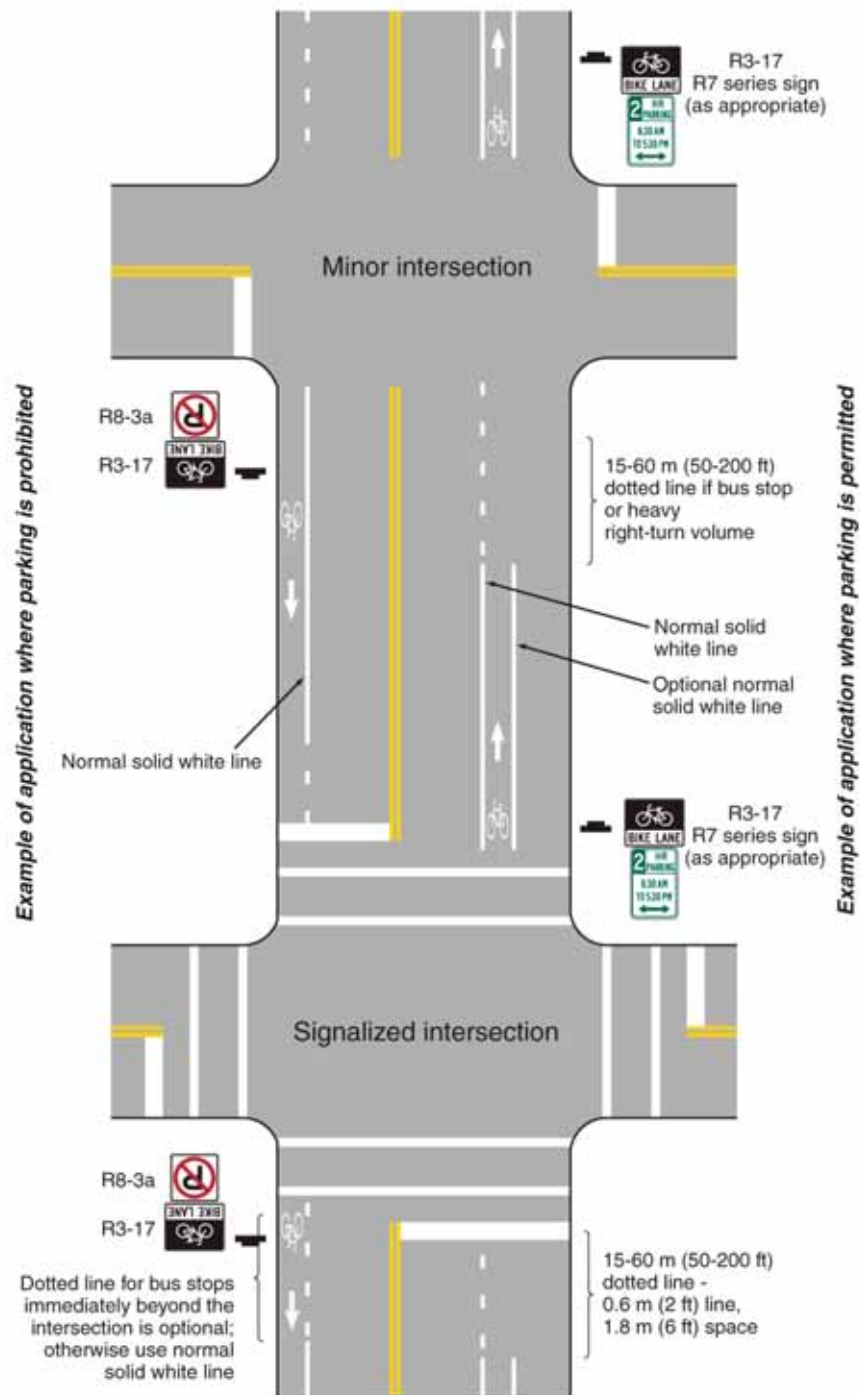
#### A.4.4.2 Application to Routes

Bike Lanes should be striped in accordance to the guidelines provided by AASHTO *Guide for the Development of Bicycle Facilities*. In addition, Bike Lanes should be painted with bike lane symbols to delineate the bicycle lane and to alert motorists to the fact that the bicycle lane is not available for parking or stopping.

#### A.4.4.3 Placement and Spacing

Lane striping should be marked with solid white lines. Striping should not extend into intersections; instead, it should end at the stop bar of a lane. Figure A.11 provides some examples of typical applications of lane markings on a two-way street.





**Figure A.11. Typical lane markings for a two-way street.**

Source: AASHTO Guide for the Development of Bicycle Facilities, Figure 7.

- 
- Diagram illustrating the dimensions and lane width for a bicycle lane. The lane width is 150 mm (6 in). The lane is marked with a white arrow pointing up and a white bicycle icon. The lane is bordered by a dark brown curb on the right. The lane is divided into sections by white lines, with dimensions of 1.8 m (6 ft) (optional) and 1.8 m (6 ft) indicated for the sections.

1. The bicycle rider symbol or the word pavement marking "BIKE LANE" may be used instead of the bicycle-only symbol.

Source: AASHTO *Guide for the Development of Bicycle Facilities*, Figure 14.

Bicycle traffic should be considered in the timing of all signals along designated bikeways. Additional guidance on the treatment of traffic signalization for bicycle traffic may be found in Chapter 2 of the *AASHTO Guide for the Development of Bicycle Facilities*.

Currently, bicycle-actuated buttons and detection devices are not implemented on DelDOT facilities. Such detection devices may be considered if the bicycle accident history or bicycle traffic volumes at an intersection or crossing warrant further improvements.

## **A.5 INTERSECTION TREATMENTS**

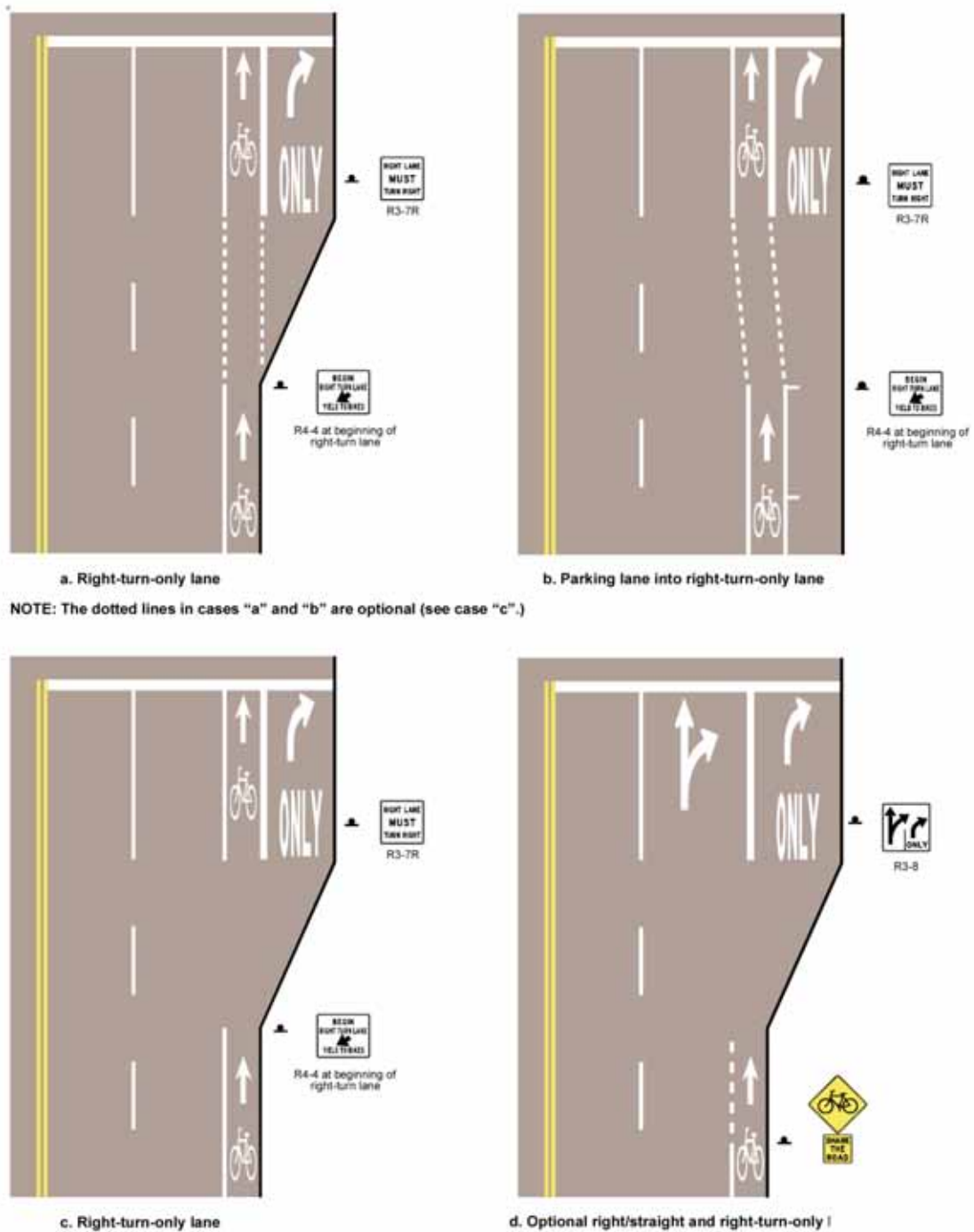
### **A.5.1 Intersections**

As noted in Section A.4.4, bicycle striping should not be continued through an intersection. Bike Lanes and Shared Shoulders should be striped to the stop bar when there is room to accommodate the bicycle lane at the approach to the intersection. Solid stripes along Bike Lanes should be replaced with a dotted line in three circumstances:

- Where motorized traffic crosses over from the through lane and into a dedicated right turn lane.
- Where there is no dedicated right turn lane, but there are heavy volumes of right-turning traffic.
- At a transit stop

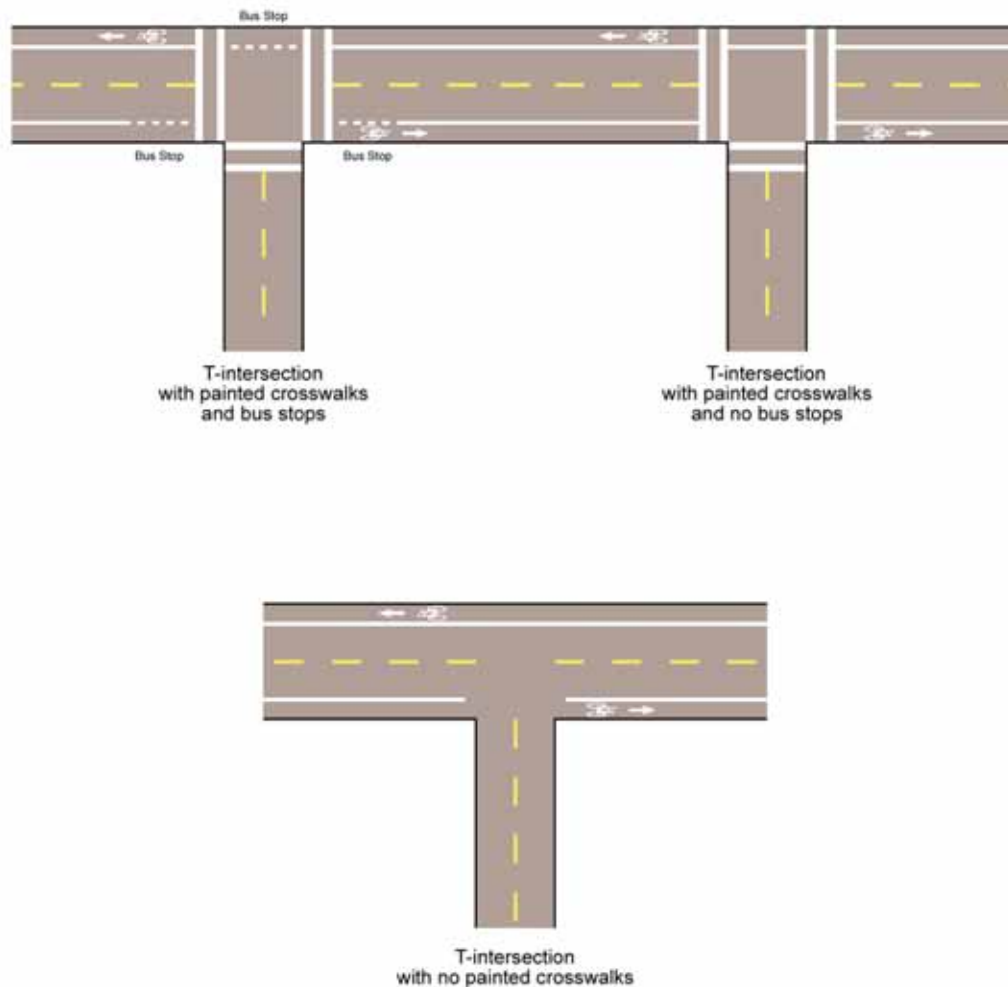
Figure A.13 provides an example of striping at an intersection with right-turn lanes.

Figure A.14 provides an example of striping at a T-intersection, as well as illustrating how bike lanes across transit stops should be treated.



**Figure A.13. Bicycle lanes approaching right turn lanes.**

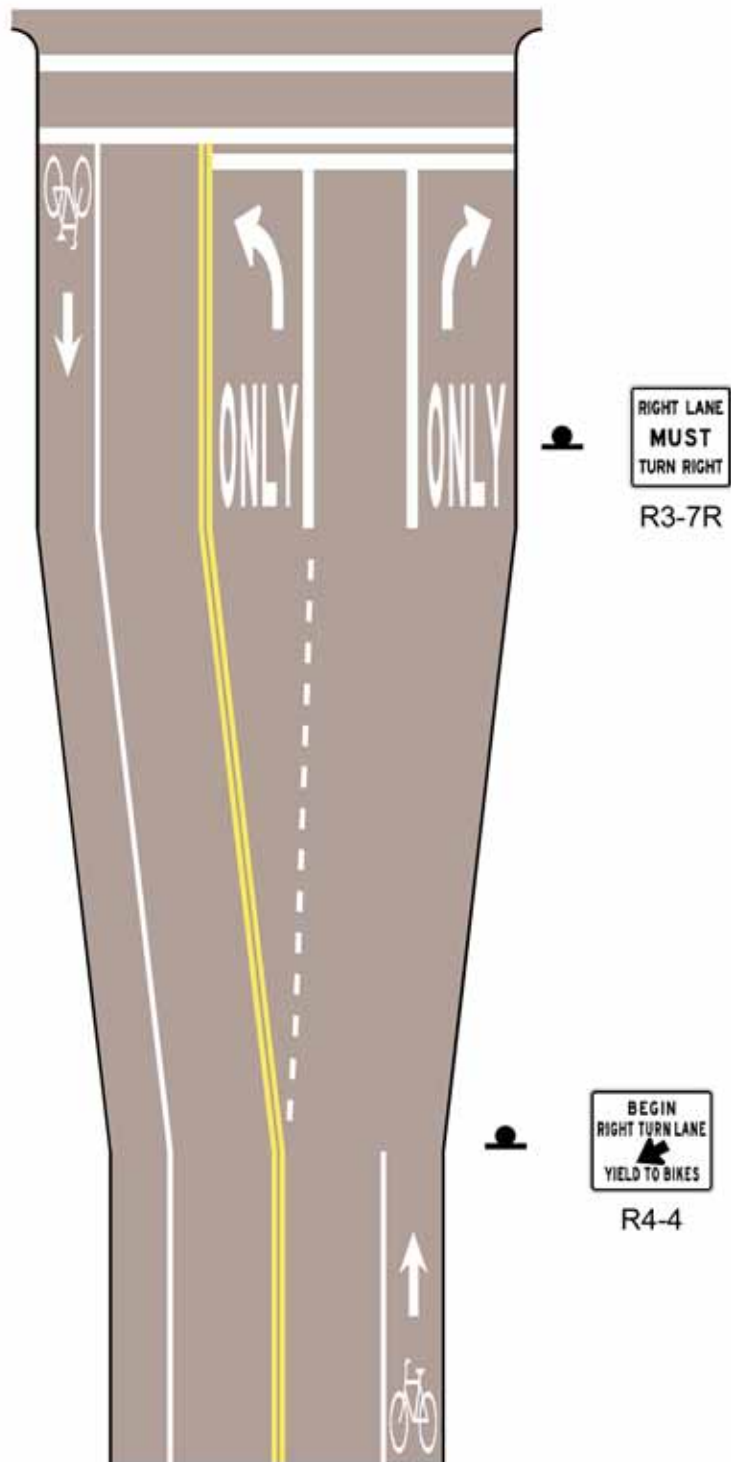
Source: AASHTO *Guide for the Development of Bicycle Facilities*, Figure 11.



**Figure A.14. Bicycle lanes at T-intersections.**

Source: AASHTO *Guide for the Development of Bicycle Facilities*, Figure 8.

If the presence of dedicated turn lanes makes it infeasible to stripe a bicycle lane to the stop bar, the striping of the bicycle lane should be discontinued prior to the turn lanes to allow bicyclists adequate distance to merge with general traffic. Figure A.15 illustrates an example of this where the left-turn lane takes up the width required for striping the bicycle lane at the stop bar.



**Figure A.15. Bicycle lanes at T-intersections.**

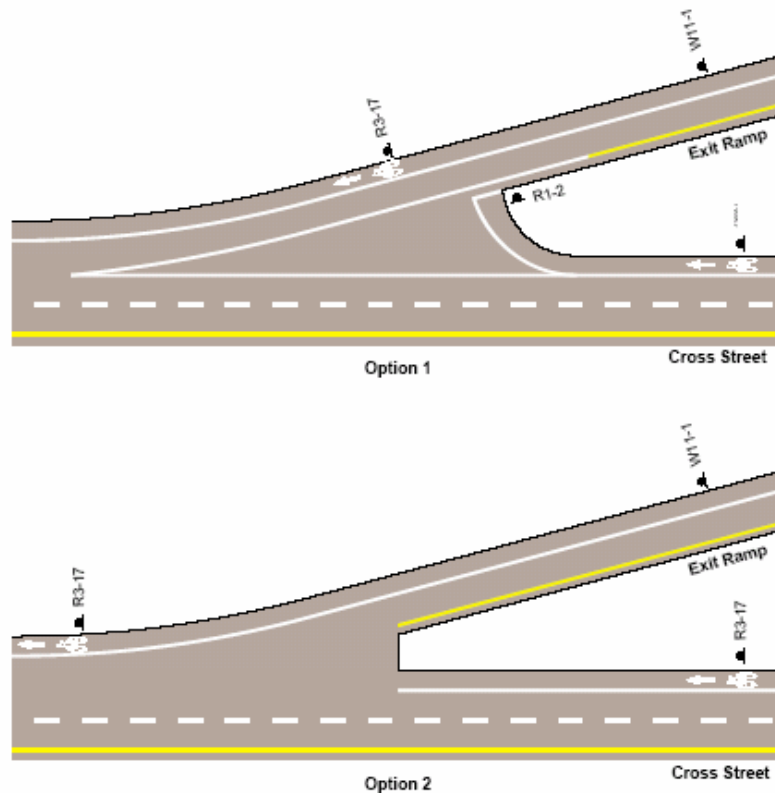
Source: AASHTO *Guide for the Development of Bicycle Facilities*, Figure 12.

For all on-road bikeways, it is to be assumed that the bicyclist is allowed the option of making either a “vehicular style” left turn (where the bicyclist merges leftward to the same lane used for motor vehicle left turns) or a “pedestrian style” left turn (where the bicyclist proceeds straight through the intersection, turns left at the far side, then proceeds across the intersection again on the cross street).

### A.5.2 Interchanges

Interchanges represent significant conflict points due to the different in speeds between motorized traffic using ramps and bicycles crossing these ramps. In addition, the grade changes at interchanges may limit line-of-sight and increase the potential for collisions.

Bicycle facilities crossing interchanges should be designed to minimize the conflict points between interchange traffic and bicycle traffic. Figure A.16 illustrates two potential configurations at a diamond interchange which would accomplish this. In the top diagram, the bicycle facility ends at a stop bar prior to the ramp, controlling bicycle crossing at this point. The bottom diagram illustrates a situation where the bicyclist is given more flexibility in choosing how to cross or merge with ramp traffic.



**Figure A.16. Bicycle lanes at an interchange.**

Source: AASHTO *Guide for the Development of Bicycle Facilities*, Figure 28.

### A.5.3 Roundabouts

Simple roundabouts (i.e. roundabouts with one lane of traffic) should not be striped with bicycle lanes. Bicycle lane striping should end 35-65 feet prior to the roundabout to give

cyclists adequate time and distance to merge with general traffic. At multi-lane roundabouts, special treatments (shared use paths, bicycle lanes, alternate routing) should be explored to improve bicycle safety.

## **A.6 BRIDGE TREATMENTS**

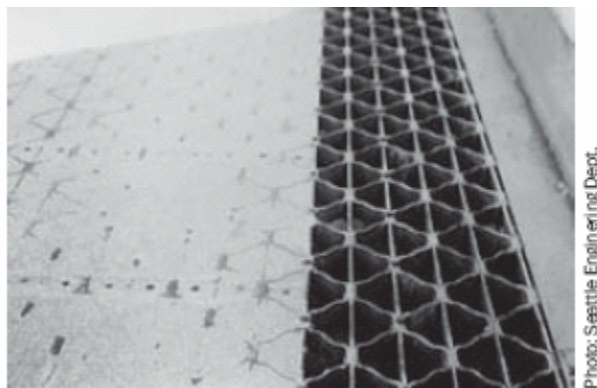
Bridges represent some of the greatest challenges to providing a continuous bicycle route. Bridge improvements designed to enhance bicycling must be evaluated on a case-by-case basis. Where facility improvements may not be sufficient to fully address safety, bicyclist should be required to dismount and use the sidewalk to cross bridge.

Bridges along all on-road bikeways should be evaluated for their ability to safely accommodate bicycle travel. Where traffic volumes are less than 2,000 average daily trips, it is acceptable to allow bicycles to use the general traffic lanes; in all other cases, efforts should be made to provide a bikeway separated from motorized traffic.

- Where the shoulders of a bridge are currently narrower than five feet, it is recommended that the travel lanes be re-striped (if possible) to increase the shoulder width for use by bicycles.
- Where there is insufficient shoulder width to accommodate bicycle facilities, the bicycle facility should be terminated prior to the bridge structure to allow bicyclists adequate time and distance to merge with traffic. In such instances, “Share the Road” signage should be posted at the approaches to the bridge to give motorists warning of the potential for bicycle traffic.
- Bicycle traffic should not be permitted on pedestrian facilities across bridges unless (a) there are two, one-way crossings of six feet each; or, (b) there is one crossing which is a minimum of ten feet wide. In all other cases, bicyclists should use the travel lane or dismount and walk their bicycles across the bridge.
- Bridges with metal grates may constitute a slipping hazard for bicycles. In such instances, the gaps in the grate may be filled with lightweight concrete along the shoulders used by bicycles. An example of this is shown in Figure A.17.
- Bridge railings adjoining the bikeway should be a minimum of 4.5 feet high to prevent bicyclists from pitching over the bridge.

It is acknowledged that it is difficult to add bicycle facilities requiring added width to an existing bridge’s cross-section. Therefore, such improvements should be considered whenever a bridge is reconstructed or re-decked. Bicycle facilities should be added as part of such work when they may be provided at reasonable cost.





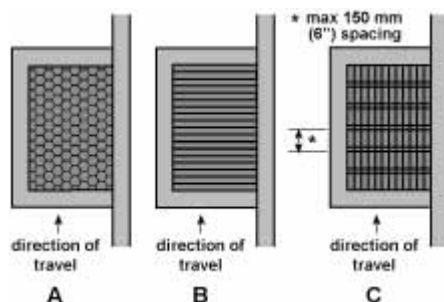
**Figure A.17. Example of shoulder treatment on bridge with steel grate.**

Source: Publication no. FHWA-RD-98-105, Implementing Bicycle Improvements at the Local Level.

## **A.7 OTHER CONSIDERATIONS**

### **A.7.1 Drainage Inlet Grates**

Where drainage grates have slots parallel to the roadway, there is the potential for a bicycle wheel to get trapped in the slot and cause an accident. To avoid this, drainage inlet grates should be designed with slots that will not catch a bicycle tire (see Figure A.18 for examples.) Drainage inlets should be retrofitted or replaced to accomplish this.



**Figure A.18. Bicycle-friendly drainage grates.**

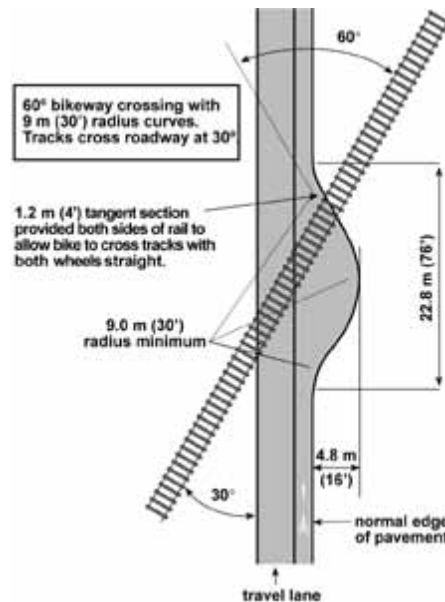
Source: *Oregon Bicycle and Pedestrian Plan*, Figure 21.

### **A.7.2 Utility Covers**

Utility covers may create an obstruction along a bikeway if they are not flush with the ground. Where possible, utility covers should be made flush with a bikeway or moved outside of the bikeway.

### A.7.3 Railroad Crossings

Where railroad crossings are not perpendicular to the roadway, the potential exists for a bicycle tire to get caught in the flangeway and for the bicycle to overturn. Such situations may be corrected by rerouting the bikeway to cross the tracks at an angle of at least 45 degrees. This may be done by widening the shoulder to allow such a crossing (see Figure A.19.) Alternatively, it may be appropriate to mark such crossings with warning sign W11-59.3.



**Figure A.19. Bicycle crossing of railroad tracks.**

Source: *Oregon Bicycle and Pedestrian Plan*, Figure 23.

### A.7.4 Rumble Strips

The ridges used in rumble strips should be perpendicular to the bikeway and no greater than 3/4-inch in height. The guidelines provided by the *DelDOT Road Design Manual* should be followed when using rumble strips in conjunction with Bike Lanes or Shared Shoulders.

### A.7.5 Traffic Calming Devices

It is recommended that bikeways be preserved through areas in which traffic calming devices have been implemented. The exception to this is at simple roundabouts, where the bike lane should end prior to the roundabout (see A.5.3 for details.) The guidelines provided by *The Delaware Traffic Calming Manual* specify that special signing shall be provided along traffic calmed streets that are designed as bicycle routes. Appropriate signing shall be used at closures and diverters to indicate that bicycle access is maintained.

Figure A.20 provides an example of Bike Lanes implemented in the area of a traffic island. This figure shows how the bikeway narrows, but still meets the minimum width

requirements for Bike Lanes. Pavers have been added between the general traffic lane and the bikeway to alert drivers when they risk crossing over into the bikeway.



**Figure A.20. Traffic calming device on Kennett Pike Greenway, facing north.**

# Appendix B:

## Description of Statewide and Regional Bicycle Routes





## **APPENDIX B: ROUTE DESCRIPTIONS**

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## **APPENDIX B**

### **INTRODUCTION**

The following route descriptions provide a detailed description of the statewide and regional routes in the Bicycle Facility Master Plan. Each description provides a route overview, a description of the route (including roadways followed), barriers and opportunities along the route, opportunities for connections, an analysis of land use considerations, and recommendations for implementation.

The routes have been numbered using the following conventions. The three statewide bicycle routes, Bicycle Route 1, Wilmington-Selbyville, and Delmar-Felton, have been numbered sequentially Bicycle Routes 1, 2, and 3 respectively. The regional routes have been designated using a county indicator (NC- New Castle, K- Kent, S- Sussex) and a number. The numbers were assigned based on the starting point of the route from north to south within the county.

All of the route descriptions have been grouped by county with the applicable portion of statewide bicycle routes listed in the beginning of each county's section.

# New Castle County



New Castle County



## **BICYCLE ROUTE 1 - NEW CASTLE COUNTY**



**Figure B.1. Bicycle Route One - SR100**

### **Route Overview**

This 70.5 mile portion of Bicycle Route 1 provides access to the areas north of Newark and Wilmington, as well as providing crossings of two of the major barriers to north-south bicycle travel, I-95 and the Chesapeake and Delaware (C&D) Canal.

### **Description of Route**

The route improves north-south bicycle mobility. Within New Castle County, the route improves bicycle mobility between the municipalities west of SR 1 in New Castle County. The route also provides connections into Pennsylvania and access to some of the more undeveloped areas of the county.

North of Old Baltimore Pike, there are two branches to Bicycle Route 1. The existing (northeast) branch begins on SR 100 (Creek Road/Montcharin Road) at Brandywine Creek State Park and Winterthur Gardens, and then continues south before turning west along Campbell Road/New London Road/Creek Road (SR 82) to Yorklyn. From there, the route continues south along Yorklyn Road (K 257). The route then travel southeast for a short stretch on Old Lancaster Pike (NC 300) and then turns south on Mill Creek Road (NC 282) following the path of Mill Creek through Hickory Hills, Brookwood Crossing, and Nob Hill. The route then continues south via Stoney Batter Road (NC 282). The route then turns southeast onto SR 7 (Limestone Road) and then turns west onto New Linden Hill Road (NC 321), and then Polly Drummond Hill Road (NC 352), which becomes Red Mill Road (NC 352) south of SR 2 Capitol Trail/Kirkwood Highway). The route then heads east along Ruthar Drive (NC 65), south along Harmony Road (NC 365), then connects west onto Ogletown-Stanton Road before turning south onto Salem Church Road (NC 348).

The proposed northwest branch of Bicycle Route 1 begins on SR 7 (Limestone Road) at the Pennsylvania State Line. It then continues south on SR 4 (Main Street/Mitch Road),

which becomes SR 7 (Stanton Christiana Road) again just south of Ogletown-Stanton Road. SR 7 then becomes Old Baltimore Pike (NC 336) at its intersection with Christiana Road/Main Street East. Then turns west and follows Old Baltimore Pike to its connection with the northeast branch of Bicycle Route 1, as described above.

The two branches merge at Salem Church Road (NC 48) and Old Baltimore Pike and continue south along Salem Church Road. South of US 40, Salem Church Road becomes Porter Loop Road (NC 48). Porter Loop Road continues south and turns west, and then continues south along Woods Road (NC 402), west on Howell School Road (NC 54), and then south on SR 896/US 301/SR 71 Summit Bridge Road. Summit Bridge Road crosses the Chesapeake and Delaware Canal, follows Choptank Road (SR 15) south to the Town of Middletown, where SR 15 becomes Bunker Hill Road. East of US 301 in Middletown, SR 15 becomes Main Street West (SR 299) and then continues south on Broad Street South (SR 71). Outside of Middletown, Broad Street South becomes Summit Bridge Road and continues west towards Kent County and Clayton, Delaware via Green Giant Road (NC 458). The route then continues south on Wiggins Mill Road (NC 446) to Caldwell Corner Road/Main Street (NC 25) in Townsend. The route heads east on Main Street and then south on Commerce Street to Dexter Corner Road (NC 36/SR 15), and Van Dyke Greenspring Road (SR 15/NC 47). This route enters Kent County via Clayton Greenspring Road (SR 15/NC 482), which becomes Duck Creek Road West (NC 38) upon entering the Town of Clayton.

### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** As would be expected from a statewide facility, roadway conditions vary significantly along the route. In the areas north of Newark and Wilmington, the northeast branch of the route consists of hilly, winding, two-lane roads with minimal (or no) shoulders. Traffic volumes are low on SR82; however, the limited lines of sight may pose a safety hazard. Traffic volumes on SR100 are heavier, adding to the difficulty of bicycling along sections of this road which do not have shoulders.

Along the northwest branch of Bicycle Route 1, there are four lanes of traffic with shoulders suitable for bicycle facilities. However, the terrain is hilly and shoulders are taken up by turn lanes at some intersections.

Between Old Baltimore Pike and SR896, the route consists predominantly of two-lane roads with shoulders and moderate volumes of traffic. Along SR896, the road has four lanes and shoulders. South of SR896, the roadway is predominantly two-lane with shoulders, except in the towns of Middletown and Townsend, where roadways have on-street parking, which may create conflicts between bicycle and automobile traffic. The entry into Kent County near Clayton is on lower volume two-lane roads.

**Major intersections.** Bicycle Route 1 was originally designed to avoid as many major roadways as possible to provide a more recreational experience for cyclists; as such, the number of major intersections along the route has been minimized. The major intersections on this route are located north of the C&D Canal. The

northwest branch of Bicycle Route 1 traverses the intersection of SR7 and SR4, then immediately crosses over the interchange at I-95. This is a section of roadway that carries high volumes of traffic and has multiple turn lanes, as well as the on-off ramps of the I-95 interchange.

The northeast branch of Bicycle Route 1 crosses I-95 on an overpass along Salem Church Road, thereby eliminating the potential conflicts associated with on/off ramps. However, the shoulders on the bridge are narrow due to the presence of sidewalks, and the curvature of the span may reduce lines of sight. (See Figure B.2.)



**Figure B.2. Salem Church Road over I-95, facing north**

**Water crossings.** The most significant barrier along this route is the C&D Canal. The current crossing is at the Summit Bridge on SR896. This bridge has narrow shoulders and provides good lines of sight; however, the volumes and speed of traffic along this bridge may deter less experienced cyclists.

A smaller water crossing exists on the northwest branch of Bicycle Route 1 along SR7. While White Clay Creek is not a large body of water, the overpass at this point carries high volumes of traffic and has narrow shoulders. It may be appropriate to redirect the bicycle route from SR7 onto Stanton-Christiana Road, which ends at a multi-use trail which crosses White Clay Creek and reconnects with SR7.

**Railroad crossings.** Both branches of Bicycle Route 1 cross the CSX Railroad and Amtrak's Northeast Corridor. These are grade-separated crossings, where lines of sight and traffic speeds may discourage less experienced cyclists.

Further south, there are at-grade crossings with the Norfolk Southern Railroad at Porter Road, Main Street (Middletown), Green Giant Road, Main Street

(Townsend), Dexter Corner Road, Blackbird Station Road, and Clayton-Greenspring Road. The crossings at Clayton-Greenspring Road and Dexter Corner Road are not at right-angles to the road, and may pose a hazard for cyclists.

### **Opportunities for Connections**

- Regional/Statewide Destinations and Activity Centers:
  - Bicycle Route 1 provides a direct connection to the Commonwealth of Pennsylvania, offering opportunities for longer, regional trips in the Mid-Atlantic.
  - Bicycle Route 1 continues from New Castle County south into Kent and Sussex Counties, providing access to numerous municipalities and recreational destinations.
- Regional Bicycle Routes:
  - MD Border to Bike Route 1 (NC-4)
  - White Clay Creek to Delaware City (NC-2)
  - Newark to Wilmington via WCC State Park (NC-2)
  - Newark Circulator (NC-5)

### **Land Use Considerations**

The northernmost portion of this route falls in an area designated as Investment Level 4, areas protected from development as specified by the *Strategies for State Policies and Spending (State Strategies)*. Although these areas typically receive the lowest priority for investments, the connections this route provides to Pennsylvania and within northern New Castle County for recreation and touring may increase its attractiveness for bicycle facility investments.

Between SR41 and US 40, the route runs through areas classified by the *State Strategies* as Investment Levels 1 and 2. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling), while investments in Level 2 are considered less of a priority.

Between US 40 and Middletown, the route falls in areas designated as Levels 2 and 3. Within the municipalities of Middletown and Townsend, areas are designated as Levels 1, 2, and 3 by the *State Strategies*. While transportation investments in Levels 2 and 3 are considered less of a priority than investments in Level 1 areas, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

South of Middletown, the route falls in areas classified as Level 4 Investment Areas. While such areas are considered to have the lowest priority for transportation investments, it may be possible to provide the majority of the bicycle facility improvements in this area as part of regular roadway maintenance and reconstruction activities.

## **Recommendations**

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.



## **BICYCLE ROUTE 2 - NEW CASTLE COUNTY**

### **Wilmington-Selbyville**



**Figure B.3. Philadelphia Pike east of Riverside Road, facing east**

#### **Route Overview**

This 55-mile portion of Bicycle Route 2 improves north-south bicycle mobility in New Castle County, and provides passage over two of the largest barriers to bicycle mobility in the state, I-95 and the Chesapeake and Delaware (C&D) Canal. The route also provides access from the Pennsylvania State Line to Wilmington, New Castle, and points south.

#### **Description of Route**

The route begins with two branches, one running from the Pennsylvania State Line to Wilmington via SR52 (Kennett Pike/Pennsylvania Avenue), and the other entering from the northeast via US 13 and Business US 13 (Philadelphia Pike and Market Street.) The two branches meet at the intersections of Market Street and 11<sup>th</sup> Street and Walnut Street and 12<sup>th</sup> Street, respectively (two one-way pairs in Wilmington.) The route then turns east on 4<sup>th</sup> Street, then travels south via SR9 New Castle Avenue across the Christiana River into New Castle.

Once in New Castle, the route turns west onto Ferry Cutoff/Delaware Street (SR9), then southeast on Washington Street (SR141), and then west onto 7<sup>th</sup> Street/River Road (SR9). The route then continues south on SR9 past the National Guard Training Station and over Red Lion Creek. South of SR72, SR9 becomes Clarks Corner Road (NC 378). The route continues south on Clarks Corner Road (NC 378), which becomes Delaware Street (NC 378) then south on US 13 (DuPont Parkway). The route then crosses the C&D Canal via the St. Georges Bridge. From the bridge, the route heads south on US 13 then turns east onto Port Penn Road (NC 2) at Biddles Corner. The route returns to SR9 and continues south into Kent County.

## Barriers and Opportunities

**Lane Widths/Road Geometry.** As this route proceeds through the most urbanized portion of the state, road geometry varies widely. The northeast branch of the route enters Wilmington via Business Route 13 with four lanes of through traffic and shoulders wide enough for a bicycle facility. The northwest branch of the route follows Kennett Pike, which is a two-lane road striped with bicycle lanes.

Within Wilmington, the route proceeds along one-way street pairs. The presence of on-street parking combined with the higher volumes of traffic may create conflicts with bicycles, although one-way traffic may be easier for bicycles and autos to navigate.

South of Wilmington, SR9 is a four-lane road with a raised median. Shoulders on this road are adequate for a bicycle facility, but are interrupted in places by access points to adjoining properties. Ferry Cut Off (SR9) and Washington Street are both two-lane roads with shoulders.

South of New Castle, SR9 is a two-lane roadway with shoulders. Clarks Corner Road has no shoulder and a steep slope on both sides, which may constitute a hazard for bicyclists who need to leave the roadway to avoid traffic. US 13 is a four-lane road with a raised median and shoulders.

The remainder of the route in New Castle County consists of two-lane rural roads. The roads do not have shoulders; however, traffic volumes are low and may allow automobiles to pass cyclists without trouble.

**Major intersections.** The portion of the bicycle route within Wilmington includes numerous intersections with high volumes of traffic. The route should be properly marked and signed for both motorists and bicyclists.

The I-295 interchange at US 9 constitutes one of the biggest barriers to bicycle mobility between Wilmington and points south (see Figure B.4.) While there are shoulders and sidewalks present at this crossing if a bicyclist would wish to dismount, the curvature of the ramps and the arch of the overpass limit lines of sight. The speed and volume of traffic at this interchange may warrant additional improvements to enhance bicycle safety.

The interchange of SR202 (I-95) at SR52 is also a high-volume interchange which may deter less experienced bicyclists. There is no shoulder under SR202; however, a sidewalk is present through this interchange, allowing cyclists to dismount and pass through the intersection.



**Figure B.4. I-295 interchange at SR 9, facing south**

**Water crossings.** There are three major water crossings along this route. The northernmost crossing occurs in Wilmington on Market Street over the Brandywine Creek. This is a four-lane bridge crossing with sidewalks and no shoulders. The through lanes along this bridge may be wide enough to re-stripe and add a bicycle facility.

The second water crossing occurs over the Christiana River. This bridge carries a high-volume of traffic that may deter less experienced bicyclists. Sidewalks on this bridge could allow bicyclists who are uncomfortable to dismount and make their crossing.

The most significant water crossing along this route is at the St. Georges Bridge over the Chesapeake and Delaware Canal (see Figure B.5.) This is a four-lane bridge with a guard rail running down the median. There are no shoulders on this bridge. Traffic volumes on this road have declined since the opening of SR1. However, it is anticipated that volumes will increase as development continues south of the Canal. As this is only one of only three bridges available for bicycles to cross the Canal (the SR1 bridge is limited access), it is critical to develop facilities or operational solutions to accommodate bicycle traffic on this bridge.

**Railroad crossings.** There are three railroad crossings along this route. The first is an underpass of the Amtrak Northeast Corridor. The roadway narrows under this crossing and there are no shoulders. This may pose a safety hazard for bicyclists.

The second and third crossings occur along SR9 at the Norfolk Southern line. These are close to 90-degree at-grade crossings and should not constitute a major barrier to bicycle travel.



**Figure B.5. St. Georges Bridge, facing north.**

### **Opportunities for Connections**

- Major Destinations and Activity Centers:
  - The route follows the Kennett Pike Greenway, providing access to the Northern Delaware Greenway and Pennsylvania.
- Regional Bicycle Routes:
  - MD Border to Bike Route 1 (NC-4)
  - Brandywine to Naamans Corner (NC-1)
  - White Clay Creek to Delaware City (NC-2)
  - Newark to Wilmington via WCC State Park (NC-3)

### **Land Use Considerations**

The majority of the route from the Pennsylvania state line to New Castle fall in areas classified as Investment Level 1 by the *Strategies for State Policies and Spending (State Strategies)*. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling.)

Between New Castle and the C&D Canal, the route lies in areas classified as Levels 2 and 3 by the *State Strategies*. Level 2 areas are considered less of a priority than Level 1, but still good candidates for providing alternatives to automobile travel. While transportation investments in Level 3 are considered to be low priority under the *State Strategies*, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

From south of the C&D Canal to the Kent County line, the majority of SR9 is located in an area designated as Level 4, areas protected from additional development. However, it may be appropriate to improve bicycle facilities along this portion of the route in the interest of route connectivity and enhancing recreational opportunities along the Delaware River.

## **Recommendations**

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.

## **ROUTE NC-1**

### **Brandywine to Naamans Corner**



**Figure B.6. State Route 92 at U.S. 13 facing south**

#### **Route Overview**

This 5.7 mile Regional Bicycle Route (as shown on the New Castle County map as Route NC-1) begins at the intersection of US Route 202 and State Route 92 in Brandywine and travels along State Route 92 until its intersection with US Route 13 in Naamans Corner.

#### **Description of Route**

This route provides a direct link from US Route 202 to the Delaware River via State Route (SR) 92 (Naamans Road), while providing bicycle access to the northeastern-most section of New Castle County. This route would connect the urbanized areas of Brandywine and Ways Corner, through to Naamans Corner and the Delaware River, while also linking key commercial and recreational areas such as the Brandywine Town Center, the Bechtel School Park, and the Tri-State Mall.

The bicycle route operates entirely on SR 92 in a mixed traffic environment. Most of the route is a wide 4-lane highway with 10-foot shoulders; however, the shoulders are regularly used as turning lanes by automobiles.

#### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** Most of the bicycle route features wide 10-foot shoulders which could easily accommodate bicycle traffic. However, these shoulders are regularly used as right turn lanes for traffic resulting in potential bicycle-automobile conflicts. The area between the CSX tracks heading east to Merribrook Road in Carpenter is the only segment of the route without a median or sidewalks.

The terrain along this route is gentle with a slightly hilly section located between Merribrook and Shipley Roads. The section of the route between US 13 and I-95 is also quite hilly.

**Traffic.** Traffic volumes are moderate for a roadway of this dimension and speeds along this corridor do not appear to inhibit bicyclists choosing this path. However, care should be used in areas in which cross streets occur particularly in the area from Brandywine to Ways Corner.

**Major intersections.** SR 202 and SR 92 meet at a major intersection which is marked by two left turn lanes, a right turn lane and two through lanes. It is developed on three of the four corners and provides curb cuts fronting SR92 at the gas stations. Furthermore the interchange between SR92 and I-95 is subject to higher traffic volumes without the added security of a shoulder. A grassy median is present and could be reclaimed to provide additional space on-road for bicyclists.

**Railroad crossings.** At the intersection of SR 92 and US 13, the corridor crosses the railroad tracks via a bridge located just to the south of the intersection. At this location, the roadway consists of 4 lanes with sidewalks and shoulders. A second at-grade crossing at US 13 and Ridge Road is located at the end of the route. This crossing has no shoulder in the southbound direction and a sidewalk in the northbound direction.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 2, providing access to Pennsylvania as well as Wilmington and points south.
- Recreational Connector along SR92, providing access to the trails in Brandywine Creek State Park
- Major Highways:
  - US 13
  - US 202
  - SR3
  - SR261.

### **Land Use Considerations**

A variety of land uses, ranging from residential to institutional and industrial uses, exist throughout this 5.7-mile corridor. The western segment of the corridor is more densely populated and provides the greatest market of potential bicyclists to draw from. The Widener University extension campus, which provides law and adult education classes, is also located within this corridor. This type of land use is complementary to alternative transportation modes including bicycle travel. The neighborhood development along the western portion of the route has potential to draw users from both the northern and southern sides of the SR 92 corridor for bicycle travel.

The bike route terminates at the intersection of SR 92 and US 13 near the Delaware River. Directly east of the terminus is an industrial tank farm and Amtrak railroad sidings. The potential for riverfront access for commercial or recreational usage in the vicinity of the route should be explored to capitalize on the waterfront while still maintaining the safety and security of the important infrastructure resources represented by the tank farm and Amtrak.

The land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 1 and 2 in *Strategies for State Policies and Spending* study. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.



## ROUTE NC-2

### White Clay Creek to Delaware City



**Figure B.7. Paper Mill Road at White Clay Creek**

#### Route Overview

This 23-mile Regional Bicycle Route (shown as Route NC-2 on the New Castle County map) begins in northwest New Castle County at the intersection of SR72 and SR7 and terminates in eastern New Castle County at the intersection of SR9 and Port Penn Road (NC 2). From SR 7 the route follows SR 72 southwest to Delaware City. The route continues south where it becomes SR 9, it crosses the C&D Canal and continues south to where the roadway meets SR 896.

#### Description of Route

This route provides access and connectivity to many major highways, Regional and Feeder Bicycle Routes in north-central and northwestern New Castle County. Most of the route is on SR 72, a major 4-lane highway with occasional fifth lanes for turning movements at major intersections. The route crosses the C&D Canal and White Clay Creek, Bicycle Route 1, the Amtrak Northeast Corridor rail line, Norfolk-Southern Delmarva Secondary Line, and the Norfolk-Southern New Castle Secondary line. Traffic volumes may be heavy at times and speeds can be fast (over 45 mph).

#### Barriers and Opportunities

**Lane Widths/Road Geometry.** Most of the bicycle route features shoulders of varying widths to service bicycle traffic. However, in some cases, these shoulders are shared with right turning traffic, which is particularly hazardous for bicycles. An off-ramp at SR2 73 onto southbound Salem Church Road (NC 348) is particularly noteworthy as it cuts right across the path of bicyclists.

Within the City of Newark, the roadway is typical of that found in established town centers, with sidewalks on both sides of the road. Where on-street parking is present, there is the potential for conflicts with bicycle traffic. Similar conditions exist in Delaware City; however, traffic volumes in this municipality are lower than those in Newark, reducing potential conflicts with motorized traffic.

Some places have narrow or no shoulders including SR 72 between Webb Lane and I-95 and SR 72/NC 13 at White Clay Creek where a narrow sidewalk exists, but there is no shoulder or designated bicycle lane. Where SR 72/NC 13 goes under the bridge carrying the Pomeroy Line Railroad, the roadway narrows significantly and no shoulder or other designated bicycle lane is available.

SR 72 from Possum Park Road to SR 7 is winding and hilly with a steep hill southwest of SR 7 that may be particularly challenging for many bicyclists, including experienced cyclists.

**Major intersections.** As noted earlier, SR 72 crosses many of the major roads serving New Castle County including SR 9, US 13, SR 71, US 40, I-95, US 1, SR 4, SR 2, and SR 7. Public comments identified the intersection of Pike Creek Road (NC 316) and Paper Mill Road (SR 72) as particularly troubling, as the hills along Pike Creek Road limit lines of sight.

**Traffic.** The roads on this route consist of major state highways of at least four lanes with posted speeds of up to 50 mph. Traffic volumes can be heavy in the more urbanized portions of Newark where SR 72 meets SR 2, SR 896, Main Street, and other local roads.

**Water crossings.** The most significant barrier along this route is the crossing of the C&D Canal at the Reedy Point Bridge (see Figure B.8). The bridge and its approaches are over one mile long. There are no shoulders along this bridge and the southbound approaches curve before reaching the bridge, reducing line of sight.

The route also crosses the White Clay Creek north of Newark. The two travel lanes on the bridge may be wide enough to stripe bicycle facilities; however, the traffic volumes on this bridge may pose a safety issue or deter less experienced bicyclists.

**Railroad crossings.** The bicycle route crosses over four railroad crossings. There is an at-grade crossing of the Amtrak Northeast Corridor at SR 273. The road at this crossing is two lanes wide, with a 10-foot shoulder suitable for use as a bicycle facility.

There is an at-grade crossing of the Norfolk-Southern Delmarva Secondary line at Reybold Road in Newark. The crossing is at a 30 degree angle, which requires that cyclists slow down and adjust their angle or risk catching a tire in the tracks. A second crossing of this rail line just south of Cleveland Avenue is an underpass with 2 lanes and a very narrow one-foot wide shoulder.



**Figure B.8. Reedy Point Bridge, facing south**

The at-grade crossing of the Norfolk-Southern Delmarva Secondary line south of Porter Road is at a more comfortable 90 degrees.

#### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington to Selbyville (Bicycle Route 2)
- Recreational and Feeder Routes:
  - Newark Circulator (NC-5)
  - MD Border to Newark (NC-6).
- Major highways:
  - SR 9
  - US 13
  - SR71
  - US 40
  - I-95
  - US 1
  - SR 4
  - SR 2
  - SR 7

### **Land Use Considerations**

A variety of land use conditions exist along the 30-mile route, including rural and sparsely developed areas, areas of discontinuous suburban style development, and more urbanized density. The most densely developed areas with the most propensities for bicycle travel are in the area where SR72 meets with State Roads 2, 273 and 896 in the “heart” of Newark and near the campus of the University of Delaware.

The three land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 3, 2, and 1 respectively of the *Strategies for State Policies and Spending*. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE NC-3**

### **Newark to Wilmington via White Clay Creek State Park**



**Figure B.9. Delaware Avenue near SR2 - Newark**

#### **Route Overview**

This is a 15-mile Regional Bicycle Route (shown as Route NC-3 on the New Castle County map). The route begins at SR 2 in Newark and travels northeast through White Clay Creek State Park, and along SR 34 to SR 48 into Wilmington to the intersection with US 13.

#### **Description of Route**

This route provides access to and from the two major urban centers in New Castle County, while also connecting to White Clay Creek. The route also provides access to major highways, Statewide Bicycle Routes, other Regional Bicycle Routes, and Recreational Bicycle Connectors.

The bicycle facility follows existing roadways with varying cross-sections in mixed traffic. The connection to Newark is along SR 2 - a four-lane roadway with shoulders. The route follows a section of Bicycle Route 1 north along Polly Drummond Hill Road (NC 352), then continues east along Pike Creek Road (NC 322), a short (less than ½-mile) section of SR 2, then onto Milltown Road (NC 318). The route then moves north along Duncan Road (NC 281) and then goes onto SR 34 (Faulkland Road)– a two-lane road with varying cross-section and then to SR 48 – a roadway which varies in width from 2 to 4 lanes as it enters Wilmington. The route crosses White Clay Creek, Bicycle Route 1, and the CSX rail line. Traffic volumes may be heavy at times and speeds can vary, particularly in the urban areas.

## Barriers and Opportunities

**Lane Widths/Road Geometry.** The bicycle route follows roads of varying capacity to accommodate bicycle travel. The bicycle route near Newark features shoulders of varying widths that could service bicycle traffic. In Wilmington, the route follows urban roads with on-street parking and limited road width. The center section, including the access to White Clay Creek State Park, is along roads that are typically two lanes with varying shoulder.

SR 34, near its intersection with SR 41, is hilly with curves that may limit sight distance for drivers; also, some of the hillier sections of this road do not have shoulders. As the route enters Wilmington on SR 48, there is on-street parking and higher traffic volumes, characteristics typical of an urban street environment.

Some sections of the urban routes and hilly sections may be challenging for all but the most experienced cyclists.

**Major intersections.** The interchange at Route 202 (I-95) and SR 48 carries heavy traffic volumes and there are no shoulders available for bicycle facilities under the overpasses (see Figure B.10.)



**Figure B.10. SR 48 at SR 202, facing northwest**

There are two significant intersections that may cause difficulties for bicyclists. The intersection of SR 41 and SR 38 has a steep slope on its western approach, reducing lines of sight. It also has no shoulders. The intersection of Milltown Road and SR 7 will pose challenges for the novice bicyclist.

**Traffic.** Traffic volumes can be heavy in the more urbanized portions of Newark where SR2 enters the city and in Wilmington along SR48 (Lancaster Avenue and Martin Luther King Drive). Traffic is a particular issue in the Wilmington area where shoulders are not present.

**Railroad crossings.** There are three rail crossings along this route. The first is at-grade on Faulkland Road near Red Creek. It is in a hilly area where no shoulder exists. The second is also an at-grade crossing on Faulkland near Oakhill. The third crossing is under a railroad bridge which restricts the roadway near Lancaster Avenue and Greenhill Road. Bicyclists must position themselves correctly in the travel lane in order to cross through this restricted road width.

### **Opportunities for Connections**

- Major Destinations and Activity Centers:
  - Connects Newark and Wilmington
  - White Clay Creek State Park
- Statewide Bicycle Routes:
  - Bicycle Route 1
- Regional Bicycle Routes:
  - Delaware City to White Clay Creek State Park (Route NC-2)
  - Newark Circulator (Route NC-1)
- Major Highways:
  - SR 2
  - SR 7
  - SR 41
  - SR 141
  - SR 48
  - US 13
  - I-95

### **Land Use Considerations**

Various land use conditions exist along the 15-mile route, as it moves through suburban style and exurban style developments while connecting to the two highly urbanized areas. Dense areas exist along Route 2 in and near Newark and along Route 48 and the entrance to Wilmington as the route connects the two urban centers.

The three land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 1, 2, and 3 respectively of the *Strategies for State Policies and Spending*. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities.

## **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.



## **ROUTE NC-4**

### **MD Border to Bike Route 1**



**Figure B.11. SR 273 and Old Casho Road facing north**

#### **Route Overview**

This regional bike route (shown as NC-4 on the New Castle County Map) begins at the Maryland border and runs along SR 273 to SR 141 near the New Castle Historic District. This portion of the route covers 7.2 miles. An additional 8.4 miles of this route travels between SR 273 and the Maryland border to Bike Route 1 and Country Road 347. In total this route covers 15.6 miles. This route provides east-west access and connectivity across New Castle County and connects a variety of important features land uses including the University of Delaware's Newark Campus, the Westgate Corporate Center, the New Castle Airport and the New Castle Historic District.

#### **Description of Route**

This regional bike route begins at the Maryland border and runs along SR 273, passing over I-95 via Christiana-Ogletown Road (NC 18). It continues along SR 273 until it's intersects with SR 141 near the New Castle Historic District. The portion of this route operates between SR 273 and the Maryland border to Bike Route 1 and Country Road 347.

This bicycle route operates entirely on existing roadways with mixed traffic. Most of the route is located on SR 273, a major four-lane highway with occasional turning lanes and an intermittent shoulder. An existing bike lane is in place through Newark. This proposed routing would extend that route eastward to neighboring communities.

## Barriers and Issues

**Lane Widths/Road Geometry.** The proposed bike route features existing 10-foot shoulders along most sections. In other sections, due to limited roadway widths, shoulders cannot be accommodated. In many of the urban areas along the route the route is pinched - characterized by moderate to heavy traffic and no opportunities to accommodate a separate marked bike lane. In other instances, the turn lanes utilize space that otherwise could accommodate a shoulder bike route.

The following segments of the Maryland Border to Bike Route 1 route do not have a shoulder present for bicyclists:

- I-95 underpass along SR 273
- SR 273 south of I-95 Christiana exchange
- Intersection of SR 273 and US 13
- Liberty Avenue to Marrows Road

**Major intersections.** SR 273 noted earlier, SR 72 crosses many of the major roads serving New Castle County including SR 9, US 13, SR 71, US 40, I-95, US 1, SR 4, SR 2, and SR 7. Public comments identified the intersection of Pike Creek Road and Paper Mill Road (SR 72) as particularly troubling.

**Traffic.** This bicycle route is comprised of a series of heavily traveled four lane roads interspersed with segments of two lane roadways. Travel speeds along the route vary by the nature of the roadway, speeding up in less developed areas and slowing down to accommodate more urban or village settings often to 25 mph.

**Railroad crossings.** The bicycle route crosses Amtrak's Northeast Corridor near the intersection of Red Mill and Christiana Roads along SR 273.

## Opportunities for Connections

This bicycle route provides access to and connections with a number of regional and feeder bicycle routes in the Newark area, including Bicycle Route 1. Also notable is that the route connects to Route 896/New London Road providing access to White Clay Creek State Park and the Millstone and Twin Valley hiking trails.

The length and east-west nature of the route provides opportunities to connect to a wide number of state routes and highways including: SR 896, SR 2, SR 72, SR 4, SR 7, SR 1, SR 37, SR 141. As well as US 13 and US 40. The route crosses over I-95 as well; however, bicycles are prohibited from operating on this route.

## Land Use Considerations

A variety of land use conditions exist along the 15.6-mile route, including rural and sparsely developed areas, areas of discontinuous suburban style development, and more urbanized density. The most densely developed areas with the greatest potential for bicycle travel are along Main Street in Newark as the University of Delaware is located directly to the south of the route and New Castle at the eastern end of the route.

The three land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 3, 2, and 1 respectively of the *Livable Delaware*

*Strategies for State Policies and Spending.* According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities.

### **Recommendations**

Segments of this route have potential to serve as a viable transportation alternative particularly in locations such as the area in the vicinity Main Street in Newark near the University of Delaware's campus. Not all of the route, however, is appropriate for recreational bicycling. Portions of the route are tight and bicyclists would be required to interact with moderate to heavy on street traffic.

It is recommended that portions of this route which can be safely signed and striped be moved forward as short term recommendations with pinch points along the route being addressed in longer term plans. This allows the bicycling community to reap immediate rewards and low-cost results in areas that have the greatest potential for success.

## ROUTE NC-5

### Newark Circulator



**Figure B.12. SR 4 east of Elkton Road**

#### Route Overview

The Newark Circulator route (as shown as Route NC-5 on the New Castle County map) is a 4.8-mile Regional Bicycle Route. The route begins at SR 896 southwest of Newark and travels east to the intersection of SR 273 (Ogletown Road). The route would be provided on a mix of dedicated bike facilities in a moderately developed suburban setting.

#### Description of Route

This east-west route travels on SR 4 (Christiana Parkway/Chestnut Hill Road) between SR 896 (Elkton Road) and SR 273 (Ogletown Road). This route improves bicycle access to the residences, businesses in southern Newark, as well as provides connections to the local bicycle network and the University of Delaware. It also provides an east-west linkage to the south of Newark and provides access to the proposed East Coast Greenway alignment.

#### Barriers and Opportunities

**Lane Widths/Road Geometry.** The majority of SR 4 is a four-lane road, with dedicated turn lanes at intersections. Between Elkton Road (SR 896) and College Avenue South (SR 896), the shoulder is already marked as a bicycle lane. From College Avenue to SR 273, there is an existing shoulder wide enough to accommodate a bicycle facility; however, this shoulder is absorbed by right-turn lanes in some places and is punctuated by access points to adjoining properties.

**Water Crossings.** There are no major water crossings along this route.

**Traffic.** Traffic volumes along this corridor are heavy, which may deter less experienced bicyclists. The volumes of traffic may also create potential conflicts between cyclists and vehicles turning onto/off of SR 4.

**Major intersections.** The intersections of SR 4 with SR 896, College Avenue, SR 72, and SR 273 all consist of multiple turn lanes and heavy traffic volumes. The intersections at SR 896, SR 72, and SR 273 are of particular significance to the bicycle network, as each of these roads is classified as a regional bicycle route. Therefore, particular attention should be paid to the need for cyclists to turn onto and off of these routes.

**Railroad crossings.** SR 4 crosses the Amtrak Northeast Corridor just east of SR 896. The overpass provides a barrier-separated crossing for bicycles in the eastbound direction; however, there is no westbound shoulder present. Since traffic volumes on this roadway are heavy, bicycle travel on this section of the route may be discouraged unless accommodations are made for westbound bicycle travel.

There is one at-grade railroad crossing of the Norfolk-Southern Delmarva Secondary line. This crossing occurs at a right angle to the roadway, and should not pose a significant safety hazard to bicycle traffic.

### **Opportunities for Connections**

- Long-Distance Bicycle Routes:
  - This route may serve as a portion of the East Coast Greenway.
  - Bike Route 1
- Regional Bicycle Routes:
  - Delaware City to White Clay Creek State Park (Route NC-2)
  - MD Border to Newark (Route NC-6)
- Recreational, local and other bicycle routes:
  - Local bicycle network of Newark via College Avenue.

### **Land Use Considerations**

The entire route is within an area designated by the Delaware Department of Planning as Investment Level 1 of the *Strategies for State Policies and Spending*. According to these policies, Investment Level 1 areas should be prioritized for investments in alternative transportation modes such as bicycling.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## ROUTE NC-6

### Maryland Border to Newark



**Figure B.13. Delaware Avenue and SR 2**

#### Route Overview

This 6.4 mile Regional Bicycle route (shown as Route NC-6 on the New Castle County map) connects the city of Newark to the Maryland border. The route follows a mix of dedicated bike lanes and shared roadways in a moderately developed suburban setting.

#### Description of Route

This route provides access to and connects several regional bike routes and major roadways in Newark, including State Routes 273, 2, 72, and 4, and well as the central Newark Roads of Delaware Avenue, College Avenue, and Main Street.

#### Barriers and Opportunities

**Lane Widths/Road Geometry.** The bike route is a mix of shared roadway and separate bike lanes.

Shared roadways range from ample shoulders to very narrow or no shoulders for bicycle travel. Areas of particular concern include SR2 at SR4 where a combination of no shoulder and turning movements (particularly right turns) in mixed traffic could be fairly hazardous. Business SR2 and Main Street also have no additional space for bikes and includes curves and turns that affect sight distances for oncoming and trailing traffic. The shoulder on College Avenue between Delaware Avenue and Main Street is marked as a bike lane (see Figure B.13. above) but in some places is noticeably narrow.

North of SR4, there are bicycle lanes along SR896 between Short Lane and Murray Road. However, these lanes disappear between Murray Road and Delaware Avenue. The inconsistency is somewhat of a concern, because bicyclists must decide what to do as they merge onto the roadway with mixed traffic.

Better signing to raise the awareness of both the bicyclists and motorist would help to alleviate this situation.

Bicycle lanes are also present on Delaware Avenue and Main Street, the one-way pair of roads running east and west through Newark.

**Major intersections.** Several intersections are noteworthy, given the largely suburban/urban landscape. The intersection of SR896 and SR4 is the location of the trailhead for an existing side path along SR 4. At SR896 and SR273, the road is split into two one-way pairs. Additionally, there is a railroad crossing at this intersection which may limit lines of sight. The intersection of SR 2 and SR 273 is at the eastern edge of the Newark central business district and would be expected to accommodate a higher level of bicycling. At the intersection of Capital Trail (SR2) and Possum Park Road (SR72), there is a narrow bridge crossing with no shoulder.

**Traffic.** The bike route is on major and minor roadways in suburban/urban environments. Traffic volumes and traffic movements are a concern where there is no dedicated space for bicycles. In the Newark urbanized area, Delaware Avenue from SR896 to College Avenue is supported by two bicycle lanes (one in each direction) that separate bicycles from the moderate volumes of traffic that flow in the area.

**Water Crossings.** There are two water crossings along this route. The first is the crossing of SR72 over White Clay Creek (see Figure B.14.) This is a four-lane bridge with sidewalks, but without shoulders. This may pose a safety issue for bicyclists, especially during peak hours of travel. The second bridge along the route is at the intersection of Capitol Trail (SR2) and Possum Park Road (SR72) is narrow with no shoulder.

**Railroad crossings.** There is only one railroad crossing along this corridor, a railroad bridge over SR72 (Capital Trail) just north of the intersection of SR2 and SR 273. It is not anticipated that this crossing will pose problems for bicyclists.

### **Opportunities for Connections**

- Statewide Bicycle Route:
  - Bicycle Route 1
- Regional Bicycle Routes:
  - MD Border to Bike Route 1, Route NC-4
  - White Clay Creek Delaware City, Route NC-2
  - Newark to Wilmington via White Clay Creek, Route NC-3



**Figure B.14. Crossing of SR 72 over White Clay Creek, facing west**

- Recreational, local and other bicycle routes:
  - Local bicycle network within the City of Newark
- Major Highways:
  - SR896
  - SR273
  - SR2
  - SR72
  - SR4
- Local Roads (Newark):
  - Delaware Avenue
  - College Avenue
  - Main Street

### **Land Use Considerations**

This area is characterized by more densely developed suburban and urban style communities within and near Newark, Delaware. The land uses in this area fall into the Investment Strategy Level 1 of the Delaware Office of Planning *Strategies for State Policy and Spending*. Investment Strategy Level 1 is applied to the most urbanized areas of the State and is a priority area for spending on alternatives to automobile travel, such as bicycle facilities.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and



maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE NC-7**

### **Middletown to SR9**



**Figure B.15. SR 299 near Appoquinimink River**

#### **Route Overview**

This 5 mile Regional Bicycle Route (shown as Route NC-7 on the New Castle County map) begins at the intersection of SR 9 (Taylor's Bridge Road) and SR 299 (Old State Road) and travels along SR 299 through the Town of Odessa to the Town of Middletown. This route provides a connection from existing Bicycle Route 1 to the proposed statewide route on Route 9 at Taylor's Bridge.

#### **Description of Route**

This route provides east-west access between Middletown and Odessa in an area of New Castle County that is rapidly developing. The bicycle facility is located entirely on SR 299, a primarily two-lane roadway. The route crosses the Appoquinimink River, US 13 and SR1. Traffic volumes are fairly light in eastern sections but can become heavier as development density increases near Middletown.

#### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** As mentioned above, SR 299 is a two-lane facility with ample shoulders in most sections. Two areas with less desirable conditions for bicyclists exist near the Appoquinimink River crossing and near where SR299 enters Middletown. At the river crossing, the presence of wetlands has constrained the width of the roadway over, which has limited the availability shoulders in this area. Near Middletown, some shoulders have been converted to turn lanes, which may cause conflicts between turning vehicles and through bicycles.

**Traffic.** SR 299 is a two lane roadway with limited traffic issues outside of the urban areas. As mentioned above, SR 299 does have ample shoulders in most areas. New development in and around Middletown could increase traffic volumes on SR 299. This could result in less desirable conditions for bicyclists at lower skill levels.

**Major intersections.** SR 299 intersects with SR 1, and US 13. The intersection with SR 1 could be difficult for the novice cyclist due to the configuration of the interchange.

**Water Crossings.** The largest potential barrier to bicycle travel along this route is the section of road across the Appoquinimink River and its surrounding wetlands (see Figure B.15.) The road narrows significantly in this area, providing no shoulders or other designated space for bicycles.

**Railroad crossings.** There are no railroad crossings in the corridor.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington-Selbyville Route 2
- Major Highways:
  - SR 9
  - US 13
  - SR 15
  - SR7/US 301

### **Land Use Considerations**

As is typical of developing areas, the land uses along this route vary and include rural, suburban, and urban areas. These land use conditions are designated by the *Strategies for State Policies and Spending* as Investment Levels 3, 2, and 1, respectively. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycling.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

# Kent County



Kent County



## BICYCLE ROUTE 1 - KENT COUNTY



**Figure B.16. Bicycle Route 1 north of Cheswold**

### Route Overview

This 37 mile portion of Bicycle Route 1 connects New Castle County with Sussex County and provides direct access to the state capital and to the other major municipalities in Kent County.

### Description of Route

The purpose of Bicycle Route 1 is to improve north-south bicycle mobility. Within Kent County, Bicycle Route 1 serves as a spine to the bicycle network, linking the major municipalities within Kent County and providing connections to all but one regional bicycle route in the county.

The portion of the route in Kent County begins in Clayton along Duck Creek Road West (SR 15). The route then proceeds west along Millington Road (K 39) and School Lane (K 40), and then continues south along Wheatleys Pond Road (SR 300), Moorton Road (K92), which becomes Commerce Street in Cheswold. Commerce Street then becomes McKee Road (K 156/SR 15) before entering the City of Dover. In Dover, the route becomes Salisbury Road and turns west onto North Street/Hazlettsville Road (K 73/SR 15), south onto Wyoming Mill Road (K195), which becomes Railroad Avenue in Camden. In Wyoming, the route follows Westville Road (SR 15/K52) and proceeds along the western edge of Camden, continuing down SR 15 on Moose Lodge Road and Dundee Road. The route then continues east on Henry Cowgill Road (Route 10A) for a brief period, then continues south on Turkey Point Road (K240), passing through Woodside and Viola along the way.

Once K240 enters Felton, the route intersects with Main Street (SR 12), then south onto Little Mastens Corner Road (K284). It then turns east onto Reeves Crossing Road (K 286), which becomes Killens Pond Road (K384) and continues east and then south, bordering Killens Pond State Park. After crossing SR 14, Killens Pond Road becomes Deep Grass Lane (K 384). The route then travels east on Williamsville Road (K 116) for a short stretch, and then continues southeast along Abbotts Pond Road (K 442) into Sussex County.

## Barriers and Opportunities

**Lane Widths/Road Geometry.** The majority of the route is on two-lane rural roads without shoulders. Between Cheswold and Wyoming, the roads have shoulders and cross-sections in keeping with an urbanized area.

**Major intersections.** Bicycle Route 1 was originally designed to avoid as many major roadways as possible to provide a more recreational experience for cyclists; as such, the number of major intersections along the route has been minimized. The two most significant intersections in Kent County are at SR8 in Dover and at US 13 south of Felton.

SR8 is a four-lane section with dedicated turning lanes at the intersection. The width of this intersection and the volume and speed of traffic here may deter less experienced cyclists.

US 13 is a four-lane divided highway with a median. Traffic volumes along this highway are high, and the posted speed is 50 mph. Signing and striping may be necessary to improve the safety of this intersection for bicyclists.

**Water crossings.** There are no major water crossings along this route which would pose a serious deterrent to bicycle travel.

**Railroad crossings.** There are three railroad crossings along Bicycle Route 1 in Kent County. The first is an abandoned at-grade crossing in Clayton, which is being discussed as a possible Rail-to-Trail connection to Easton, Maryland. The second crossing is at the Norfolk Southern Railroad at Reeves Crossing Road. This is an at-grade crossing. The third crossing is located where Deep Grass Lane intersects the east-west branch of the Norfolk Southern. This is also an at-grade crossing.

## Opportunities for Connections

- Statewide and Long-Distance Bicycle Routes:
  - Delmar-Felton - Statewide Bicycle Route 3
  - Proposed Clayton-Easton Rail-to-Trail
- Regional Bicycle Routes:
  - MD Border to Woodland Beach (K-1)
  - MD Border to Port Mahon (K-3)
  - MD Border to DAFB (K-4)
  - MD Border to Frederica (K-5)
  - MD Border to Slaughter Beach (K-6)
- Recreational, local and other bike trails:
  - Local bicycle network within the City of Dover
  - Off-road network of trails at Killen's Pond State Park

## **Land Use Considerations**

From Clayton to Cheswold, the majority of the route falls in areas classified as Investment Area 3. While transportation investments in Level 3 are considered to be low priority under the *Strategies for State Policies and Spending (State Strategies)*, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

From Cheswold to Camden, the areas traversed by the route are generally classified as Investment Levels 1 and 2 by the *State Strategies*. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling), while investments in Level 2 are considered less of a priority.

The portions of the route from Camden to Felton fall into a mixed range of Level 1, 2, and 3 Investment Areas, with the Level 1 areas being found at the center of each municipality along the route.

From Felton to the northern outskirts of Harrington, the route lies in areas classified as Investment Level 4. Such areas are protected from development as specified by the *State Strategies*. Although these areas typically receive the lowest priority for investment, the north-south connections this route provides may increase its attractiveness for bicycle facility investments.

Immediately south of Harrington is a Level 3 Investment Area, after which point the route continues through Level 4 areas until reaching the Sussex County line.

## **Recommendations**

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.



## **BICYCLE ROUTE 2 - KENT COUNTY**

### **Wilmington-Selbyville**



**Figure B.17. Bicycle Route 2 on South State Street**

#### **Route Overview**

This 42-mile portion of the Wilmington-Selbyville Statewide Bicycle Route provides north-south bicycle mobility along SR9 and the US 113 corridor in Kent County. The route provides access to Kent County City of Dover, from the municipalities of Wilmington and New Castle to the North and Milford, Ellendale, Georgetown and Dagsboro to the South.

#### **Description of Route**

The purpose of this route is to improve north-south bicycle mobility along the Delaware coast. The route enters Kent County along SR9. It continues south along Bayside Drive (SR 9), turning southwest onto White Oak Road (K 66) into Dover. In Dover, the route crosses DuPont Highway (US 13), then continues south as Kings Highway (K 66), west on Loockerman Street East, and then south on State Street South (SR 10A). The route follows State Street South out of Dover, to the town of Magnolia. South of Magnolia State Street becomes Clapham Road (K 27) and continues south to Buffalo Road (K 376).

From Buffalo Road (K 376), the route turns west onto Barratts Chapel Road (K 371), then south onto McGinnis Pond Road (K 378). The route then continues southeast via Andrews Lake Road (K 380), and Johnnycake Landing Road (K 380), and then turns south onto Carpenter Bridge Road (K35), and east onto Fork Landing Road (K 390). From Fork Landing Road (K 390), the route continues east to Tub Mill Pond Road (K 119), and then south on Bowman Road (K 401) to Warner Road (K 406). Continuing east on Warner Road/11 Street, NW (K 406), the route enters Milford and then continues south via Walnut Street (K 20) to the Sussex County and the Mispillion River.

## Barriers and Opportunities

**Lane Widths/Road Geometry.** SR9 is a two-lane road without shoulders; however, traffic volumes along this road are low, and automobiles should be able to pass bicyclists without trouble. From Leipsic (K 11) to White Oak Road (K 66), the road is two-lanes wide with shoulders suitable for bicycle facilities. There are no shoulders along Kings Highway until approximately one-quarter-mile east of SR 1, where the shoulders become suitable for bicycle facilities. In Dover, Kings Highway lacks shoulders, but may be wide enough to accommodate bicycle facilities.

South State Street in Dover has on-street parking which may create potential conflicts with bicycle traffic. South of Dover, South State Street (113A) has shoulders sufficient for bicycle facilities.

The majority of the roads between Magnolia and Milton are two-lane roads without shoulders; however, traffic volumes on these segments of the route should be low enough to allow safe passing movements by automobiles around bicycles.

**Major intersections.** There are two major intersections within this portion of the Wilmington-Selbyville route. The first major intersection is the intersection of Kings Highway with US 13. This intersection carries heavy volumes of traffic and has multiple dedicated turn lanes which may make this intersection difficult for bicyclists to cross.

The second major intersection is at Warner Road (K406) and US 113. Again, traffic volumes are heavy along this segment of US 113. As Warner Road crosses US 113 right where it forks between US 113 and SR 14, the geometry of the intersection may confuse bicyclists traveling through the area for the first time.

**Water crossings.** There are several minor water crossings along SR9; at some of these, the shoulders are not wide enough for a bicycle facility and additional signage may be appropriate to alert bicyclists and motorists. The crossing of Browns Branch south of Frederica is wide enough to accommodate bicycle facilities.

**Railroad crossings.** There are no railroad crossings along this portion of the Wilmington-Selbyville statewide route.

## Opportunities for Connections

- Regional Bicycle Routes:
  - MD Border to Port Mahon (K-3)
  - SR9/MR337 to Delaware Bay (K-2)
  - MD Border to DAFB (K-4)
  - MD Border to Slaughter Beach (K-6)
  - MD Border to Frederica (K-5)
  - MD Border to Woodland Beach (K-1)

- Recreational, local and other bicycle routes
  - Local bicycle network in City of Dover
  - Off-road trails in the Cedar Swamp Wildlife Area, as well as the proposed St. Jones Greenway.

### **Land Use Considerations**

From the New Castle County line to Dover, the route lies in rural areas classified as Investment Level 4 by the *Strategies for State Policies and Spending (State Strategies)*. The *State Strategies* protect such areas from development. Although these areas typically receive the lowest priority for transportation investments, the north-south connections this route provides may increase its attractiveness for bicycling and bicycle facility investments.

From Dover to Magnolia, the areas traversed by the route are generally classified as Investment Levels 1 and 2 by the *State Strategies*. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling), while investments in Level 2 are considered less of a priority.

From Frederica to Milford, the majority of the route falls in areas classified as Investment Area 3. While transportation investments in Level 3 are considered to be low priority under the *Livable Delaware Strategies*, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

### **Recommendations**

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.

## **BICYCLE ROUTE 3 - KENT/SUSSEX COUNTY**

### **Delmar to Felton**



**Figure B.18. Drawbridge between Seaford and Blades, facing north.**

#### **Route Overview**

This Statewide Bicycle Route is a 39-mile branch off of Bicycle Route 1, improving bicycle mobility along the US 13 corridor from Kent County to the border of the state with Maryland.

#### **Description of Route**

The route begins in Kent County south of Felton at Maintenance Road 286. It continues south along Little Mastens Corner Road (K 284 and K 78) into Harrington. In Harrington, the route turns west onto Center Street, then south on West Street. The route then turns east onto Fairground Road (K 316), crosses US 13 (DuPont Highway), and then turns southeast onto Corn Crib Road (K 433). The route then continues south on Gun & Rod Club Road (K 434), then west on Woodyard Road (K 117).

From Woodyard Road (K 117), the route turns south onto US 13, continuing through Greenwood until it reaches Cart Branch Road (K 583A). At Cart Branch Road (K 583A), the route turns southwest, turning onto Adams Road, then Church Street, which it follows into Bridgeville. In Bridgeville, the route runs along Bus.13, and then turns west onto Market Street, then south onto Wilson Farm Road, which it follows into Seaford.

In Seaford, Speck Road (K 546) becomes Ross Station Road, and continues south to SR 20 (Stein Highway). The route then runs east along SR 20 to Front Street/Market Street which it follows south over the Nanticoke River out of Seaford. Market Street then becomes Seaford Road (K 13) and continues south into Laurel. The route follows SR 13 into Delmar where it terminates at the Maryland border.

## Barriers and Opportunities

**Lane Widths/Road Geometry.** North of Seaford, the majority of the route is characterized by two-lane rural roads without shoulders. South of Seaford, the route continues as a two-lane road with sufficient shoulders for a bicycle facility.

Within municipalities, the roads used by the route are typified by on-street parking, which may pose a conflict with bicycle travel in adjoining lanes. SR20 within Seaford is a five-lane roadway.

In Greenwood, US 13 is a four-lane roadway with a median. The considerable volume of traffic along this section may deter less experienced bicyclists.

**Major intersections.** The two most significant intersections along this route all occur with US 13. US 13 is a four-lane highway with a median. Traffic volumes along this road may deter less experienced cyclists.

**Water crossings.** There are two major water crossings along this route: one over the Nanticoke River between Seaford and Blades (see Figure B.18) and one over Broad Creek in Laurel (see Figure B.19.) Both of these are drawbridges with sidewalks which are barrier-separated from the travel lanes. The lack of a shoulder on either side of the roadway may require novice bicyclists to walk their bicycles using the sidewalks, which are available on both sides of the bridge.



**Figure B.19. Drawbridge over Broad Creek in Laurel, facing north.**

**Railroad crossings.** There are three at-grade crossings of the Norfolk Southern Railroad along this route: one south of Harrington, one south of Greenwood, and one north of Bridgeville.

## Opportunities for Connections

- Statewide Bicycle Routes:

- Bicycle Route 1
- American Discovery Trail, a hiker-biker trail spanning the length of the United States.
- Regional Bicycle Routes:
  - MD Border to Slaughter Beach (K-6)
  - Greenwood to Broadkill Beach (S-1)
  - MD Border to Georgetown (S-4)
  - MD Border to SR1 via Seaford and Millsboro (S-5)
  - US 13/SR30 to Fenwick Island (S-9)

### **Land Use Considerations**

The municipal areas traversed by the route are generally classified as Investment Levels 1 and 2 by the *Strategies for State Policies and Spending (State Strategies)*. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling), while investments in Level 2 are considered less of a priority.

At the outskirts of the municipalities are areas classified as Investment Area 3. (The entire route between Blades and Laurel falls under this classification.) While transportation investments in Level 3 are considered less of a priority under the *State Strategies* than investments in areas designated Level 1 and 2, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

The majority of the route running outside of the municipalities lies in areas classified as Investment Level 4. Such areas protected from development as specified by the *State Strategies*. Although these areas typically receive the lowest priority for investments, the north-south connections this route provides may increase its attractiveness for bicycle facility investments.

### **Recommendations**

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.

## ROUTE K-1

### MD Border to Woodland Beach



**Figure B.20. SR 6 Bridge, west of RD 82**

#### Route Overview

The Maryland Border to Woodland Beach route (as shown as Route K-1 on the Kent County map) is a 17.6-mile east-west Regional Bicycle Route. The route begins at the Maryland Border on SR 6 in the Blackiston Wildlife Area, travels through the Towns of Clayton and Smyrna, to Woodland Beach via the Woodland Beach Wildlife Area.

#### Description of Route

This route connects the Towns of Clayton and Smyrna with Maryland and Woodland Beach on the Delaware Bay. The route is comprised of two-lane roads with shoulders. The road narrows just east of Smyrna where it encounters a wetland area with the potential for flooding.

#### Barriers and Opportunities

**Lane widths/Road geometry.** From the Maryland Border to SR 15, SR 6 has no shoulders and the edge is soft. At the time of data collection, it appeared as if this area may have been undergoing re-pavement. Most of the remaining length of the route provides ample shoulders for bicycle traffic. However, as SR 6 comes upon wetland and beach areas, the road narrows and less space is available for bicycles. This occurs at the following two locations:

- Intersection of SR 6/SR 1 - the road narrows to only two, ten-foot lanes with no shoulders.
- SR6 crosses SR9 into the Woodland Beach Wildlife Area - the shoulders are narrowed to only 4 feet and there is water on either side of the bridge.

**Major intersections.** SR 6 crosses the following major roadways: SR 42, SR 15 (south), SR 15 (north), US 13, SR 1, and SR 9. The intersection of SR 6 with SR 13 is noted for having only two narrow lanes (10 feet) with turn lanes. There is no shoulder or extra space available for bicycle travel. At SR 1, SR 6 crosses over the road and there are no exit ramps.

**Water Crossings.** There is a water crossing of Duck Creek and the Smyrna River. The crossing of Duck Creek has two narrow shoulders and only jersey barriers separating cyclists from the water. The route encounters wetlands, signed with flood warnings as it exits the community of Smyrna from SR 1 to where SR 6 branches from Beach Road, a local road, and from SR 9 to Woodland Beach.

**Railroad crossings.** There is one at-grade railroad crossing of an unused railroad in Clayton. This rail line has been identified as a possible candidate for the Clayton to Easton Rail-to-Trail project.

### **Opportunities for Connections**

- Key Destinations and Activity Centers:
  - Clayton central business district
  - Smyrna central business district
  - Blackiston Wildlife Area
  - Woodland Beach Wildlife Area
  - Woodland Beach
- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington-Selbyville (Route 2)

### **Land Use Considerations**

Land uses vary considerably along this route, although most of the route takes place in very lightly developed or undeveloped rural land and protected park lands. These areas are almost entirely designated as Investment Level 4, areas protected from development as specified by the *Strategies for State Policies and Spending (State Strategies)*. Although these areas typically receive the lowest priority for investments, the access that this route provides to key recreational and tourist destinations may increase its attractiveness for bicycle facility investments.

This route also encounters dense mixed-use residential and commercial developments through Clayton and Smyrna. These areas are designated as Investment Levels 1 and 2, which the *State Strategies* recommend for increased investment in alternative modes of transportation.

Also notable is the Smyrna Historic District located where SR6 meets SR1. This area is probably also protected from development using the *State Strategies* policies cited above, but again provides a key destination for tourists and recreational trips.



## **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE K-2**

### **NE Dover to Kitts Hummock /Delaware Bay**



**Figure B.21. SR 9 at Little River Bridge**

#### **Route Overview**

This 12 mile route (shown as Route K-2 on the Kent County map) borders Bombay Hook National Wildlife Refuge and the Little Creek Wildlife Area, Dover Air Force Base and the community of Kitts Hummock.

#### **Description of Route**

The purpose of this route is to provide linkages between the Bay coast east of Dover with the Wilmington-Selbyville Statewide Route. The route begins at the intersection of SR 9 and K 337 (Persimmon Tree Lane). It continues south on SR 9 and provides access to numerous recreational destinations near the Bombay Hook National Wildlife Refuge, the Little Creek Wildlife Area, the John Dickenson Plantation, and the Logan Tract of the Ted Harvey Wildlife Area. The route traverses the Dover Air Force Base and then turns east onto Kitts Hummock Road at the intersection of SR 9 and US 113/SR1, and then continues to Delaware Bay.

The route is primarily serviced by two-lane roads with shoulders. The terrain is largely rural, wooded, and flat.

#### **Barriers and Issues**

**Lane widths/Road geometry.** As noted above, most roads provide adequate shoulders. The exception is in the community of Little Creek where roads serving the residential housing include on-street parking and narrow or no shoulders. Where SR 9 meets the community of Pickering Beach, the road is very narrow and has no shoulders.

**Major intersections.** The only significant intersections are at North Little Creek Road (SR8), South Little Creek Road, and SR 1. However, the traffic volumes at these intersections are low, and there are good lines of sight.

**Water Crossings.** Water crossings include the Herring Branch and Little River, which both flow into the Delaware Bay. The bridge over Little Creek does not have shoulders wide enough for bicyclists to use as a bicycle facility, although there is a sidewalk for dismounted cyclists to use.

**Railroad crossings.** There are no railroad crossings along this route.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Wilmington-Selbyville (Route 2)
- Regional Bicycle Routes:
  - MD Border to Port Mahon (Route K-3)
- Recreational connectors, local and other bicycle routes:
  - White Oak Road (K66)
  - S. Little Creek Road (K67)
- Major Highways:
  - SR8

### **Land Use Considerations**

The route is primarily rural and wooded, although there are small pockets of low-density residential housing. The entire route falls into an Investment Level 4, areas protected from development as specified by the *Strategies for State Policies and Spending*. Although these areas typically receive the lowest priority for investments, the access that this route provides to key recreational and tourist destinations may increase its attractiveness for bicycle facility investments.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE K-3**

### **MD Border to Port Mahon**



**Figure B.22. State Route 8 at Delaware Bay**

#### **Route Overview**

This 24 mile Regional Bicycle Route (shown as Bicycle Route K-3 on the Kent County map) bisects Kent County from the Maryland border to Delaware Bay.

#### **Description of Route**

The route provides east-west access and connectivity across Kent County by connecting Dover to the Maryland border to the west and the Little Creek Wildlife Area and Delaware Bay to the east. The route begins at the Maryland border and runs along SR8 through Dover to SR15. The route then follows Main Street in Little Creek (Route 15) south until it reaches Port Mahon Road (K89). The route continues east Port Mahon Road (K 89) until it reaches its terminus at Port Mahon on Delaware Bay.

The bicycle route operates entirely on existing roadways with mixed traffic. Most of the route is on State Route 8 which varies in width along its course based on the demands of varying traffic volumes and land use.

#### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** West of Dover, the route follows a rural roadway with shoulders. The roadway widens and the number of access points to local businesses increases as the route continues eastbound into Dover. Within Dover, there is on-street parking throughout a large portion of the route. The through lane displaces the shoulder when left turn lanes are present, creating a potential conflict point with bicycle travel. Shared use signs should be installed in this area.

Between Dover and SR1, SR8 is a two-lane road with shoulders. East of SR1, the shoulders disappear. Along SR9 there are no shoulders. Port Mahon Road (K89) is a two-lane road with no shoulders.

**Major intersections.** The most significant intersection along this route is where SR8 and US13 meet in Dover (see Figure B.23). This is a high-volume intersection, with minimal width on the eastbound approach.

The interchange of SR1 at SR8 may also pose issues for less experienced cyclists. In addition, there are many high-volume intersections within the City of Dover, including those at State Street, Governors Avenue (Alt.13), and SR15.



**Figure B.23. US13 and SR8, facing east**

**Traffic.** Along rural portions of this route, traffic volumes are low. Although traffic speeds in rural areas are generally higher than in urban areas, the lower traffic volumes offset this issue. Automobiles can comfortably pass cyclists by crossing into the opposing traffic's lane. Traffic volumes pick up, however, as the route continues towards Dover. Access driveways and on street parking contribute to potential conflicts between motorists and bicycles. Both drivers and cyclists need to be extra careful to ensure that conflicts between automobile and bikes are minimized.

**Railroad crossings.** The bicycle route crosses the Norfolk Southern mainline railroad tracks in Dover. The crossing is at grade and at a 90-degree angle. It does not pose a problem for bicycle travel.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington-Selbyville, Bicycle Route 2

- Regional Bicycle Routes:
  - NE Dover to Kitts Hummock/Delaware Bay, Route K-2
- Recreational, local and other bicycle routes:
  - Feeder bicycle network in the City of Dover
  - Feeder Routes in Little Creek Wildlife Area.
- Major Highways:
  - SR44
  - US13
  - US113A
  - SR9
  - SR1

### **Land Use Considerations**

A variety of land uses occur along the 24 miles of this route including urban areas in Dover, emerging development areas, rural and environmentally sensitive protected areas. The most densely developed areas provide the greatest potential for bicycle travel. However, they are also the most difficult to improve due to physical and operational constraints. Key improvements such as signage and striping will be critical to the success of the bike route – particularly in the urban areas.

The land use conditions noted above are designated by the Delaware Department of Planning by Investment Levels through the *Strategies for State Policies and Spending* as 1, 2, 3 and 4 respectively. According to these policies, the more densely developed an area, the higher its priority for spending on alternative transportation modes such as bicycle facilities. Also, the need to protect sensitive recreational and natural resources such as the Bombay Hook National Wildlife Refuge and Little Creek Wildlife Area through the provision of alternative transportation modes is also important to consider in the programming process.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE K-4**

### **MD Border to Dover AFB**



**Figure B.24. State Route 10 in Camden**

#### **Route Overview**

This 16 mile Regional Bicycle Route travels from the Maryland Border along SR10 through central Kent County and the towns of Camden and Wyoming to the intersection with US113 near the Dover Air Force Base south of the City of Dover.

#### **Description of Route**

This route travels east from the western edge of Kent County to the towns of Camden and Wyoming, terminating at the Dover Air Force Base. It also connects two statewide bicycle routes, Bicycle Routes 1 and 2.

This bicycle facility is entirely on SR10. This road begins at the Maryland-Delaware border as a two-lane rural road with shoulders. Within Camden and Wyoming the road widens and on-street parking is provided. Between US13 and US113A (S. State Street), the road widens to four lanes. While there are shoulders on these sections, the roadway pavement is often used for turn lanes to accommodate access points to local businesses and subdivisions. The road narrows to two lanes with shoulders between US113A and Dover Air Force Base.

#### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** Most of the roadway in the rural areas features shoulders of varying width. In town at Camden/Wyoming there are areas where no shoulder exists and limited right of way would require sharing of the roadway lane. Low traffic speeds in the area allow for shared roadway use.

**Major intersections.** Bicycle Route K-4 crosses major roadways in the Dover area - US13, US113, and SR1. At the intersections with US13 and US113 a bicyclist would have to transition from the shoulder to the through travel lane to safely cross the intersection, and then re-enter the shoulder on the other side. The traffic volumes at these intersections are moderate-to-high, and may deter less experienced cyclists.

At SR1, K-4 travels under the overpass. The roadway was designed with enough right-of-way to provide a shoulder with adequate space for bicycle travel.

**Traffic.** SR 10 has lower traffic volumes at its western terminus on the Maryland border due to the rural nature of the land. Near Dover the traffic volumes become more moderate and typical of suburban areas. Speeds are higher in the rural areas and remain fairly low in the Camden/Wyoming area and in the area near Dover.

**Water Crossings.** The route crosses the St. Jones River near US113 along a section of road that is two lanes wide with adequate shoulders for bicycle travel. (See Figure B.25.)



**Figure B.25. Route 10 crossing of St. Jones River**

**Railroad crossings.** The bicycle route crosses the Norfolk Southern rail line near Camden/Wyoming. The crossing here is at grade and at a direct angle and should not pose a problem for the novice or advanced bicyclist.

### **Opportunities for Connections**

- Statewide Bicycle Routes
  - Bicycle Route 1
  - Bicycle Route 2
- Major Highways
  - US13



- US113
- SR 1

### **Land Use Considerations**

A variety of land uses exist along the 19-mile route, including rural and sparsely developed areas. Suburban style development exists near Camden and on the approaches to Dover. The most densely developed areas are near the centers of Camden/Wyoming and Dover.

The land uses west of Camden are classified as Investment Level 4 of *Strategies for State Policies and Spending (State Strategies)*. Camden and the areas west of Camden are generally classified as Investment Levels 1 and 2, designations provided for urban and suburban development. According to the *State Strategies*, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities. However, the potential to connect the urbanized areas with rural areas suitable for recreational trips may warrant bicycle facility investments in Level 4 areas.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## ROUTE K-5

### MD Border to Frederica



**Figure B.26. State Route 12 in Frederica**

#### Route Overview

This 14.1 Regional Bicycle Route (shown as Route K-5 on the Kent County map) travels from State Route 12 at the Maryland Border to the intersection of SR12 and Andrews Lake Road (MR 380) at the western outskirts of Frederica.

#### Description of Route

This route provides east-west access and connectivity to Maryland and two towns in central Kent County. It also provides direct access to Statewide Bicycle Routes 1, 2 and 3.

The bicycle facility is entirely on SR12, a 2-lane roadway with adequate shoulders in most areas and low to moderate traffic volumes. In Felton, the road is two lanes with on-street parking but adequate lane width to accommodate both a bicyclist and an automobile. The route crosses the Norfolk Southern Rail line, US Route 13, SR15 and Bicycle Route 1. Traffic volumes are generally light, but speeds in the rural areas can be fast (over 45 mph.)

#### Barriers and Opportunities

**Lane Widths/Road Geometry.** Most of the bicycle route is on a two-lane rural roadway with shoulders. In one area west of Felton the road has no shoulders which may deter less experienced bicyclists, even though traffic volumes are low.

Typical sections in the town centers include limited right-of-way and on-street parking. Where on-street parking is present, there is the potential for conflicts with bicycle traffic. However, fairly low traffic volumes and speeds improve the safety of bicycling in these areas.

The Route 13 roadway crossing is challenging. However, adequate room exists for the bicyclist to travel next to the automobile through the intersection.

**Major intersections.** As noted earlier, SR12 crosses US Highway 13 near Felton. This intersection carries moderate volumes of traffic. The dedicated turn lanes and access points to adjoining properties create potential conflicts between automobile and bicycle traffic (see Figure B.27.)



**Figure B.27. SR 14 at US 13, facing west.**

**Railroad crossings.** The bicycle route crosses over the Norfolk Southern rail line in downtown Felton. This is an at-grade and controlled crossing and the rail bed is metal. This crossing is at a 90 degree angle to the roadway and should not be particularly onerous. The road at this crossing is two-lanes wide, with an adequate shoulder.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington-Selbyville, Bicycle Route 2
- Recreational, local and other bicycle routes: This bicycle route provides access to a number of recreational connectors in western Kent County.
- Major Highways:
  - US13
  - US113
  - SR15

## **Land Use Considerations**

A variety of land uses exist along the 14-mile route, including rural and sparsely developed areas, areas of discontinuous suburban style development, and more traditional urban development. The most densely developed areas are near the towns of Felton and Frederica.

The four land use conditions noted above (rural, sparsely developed, suburban, and urban) are designated by the Delaware Department of Planning as Investment Levels 4, 3, 2, and 1 respectively of the *Strategies for State Policies and Spending*. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities. Levels 1 and 2, designated for urban and suburban densities of development respectively, are given the highest priority for spending on alternative modes of transportation. Areas designated as Level 3 are rural areas with a generally low priority for such infrastructure investment. Level 4 is designated for protected lands.

## **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## ROUTE K-6

### MD Border to Slaughter Beach



**Figure B.28. SR 14 in Harrington facing east**

#### Route Overview

The MD Border to Slaughter Beach Regional Bicycle Route (shown as Route K-6 on the Kent County map) provides a cross-Delaware route which connects southern Kent County and northern Sussex County from the Maryland border to Delaware Bay. This route also links Milford and Harrington. It also provides access to recreational destinations along the Delaware Shore including Slaughter Beach and federally protected wildlife refuges. The route is a total of 25 miles in length.

#### Description of Route

The MD Border to Slaughter Beach Regional Bicycle Route crosses both Kent and Sussex Counties providing access from the Maryland border to Delaware Bay. Beginning at the Maryland border, the route follows SR 14 to Walnut Street south in Milford. It then follows SR 36 until reaching Slaughter Beach.

#### Barriers and Opportunities

**Lane Widths/Road Geometry.** The proposed bike route follows a typical rural roadway segment. SR 14 is without shoulders except when passing through Harrington and Milford. Additionally, traffic speeds are decreased significantly and on-street parking is provided. There are two key intersections of note along this route. At the intersection of SR 14 and US 113 on the western side of Milford, there are no shoulders on the intersection approaches. The number of lanes decreases from four to two between US 113 and Maple Avenue

**Major intersections.** The route intersects three major roadways: US 13, US 113, and SR 1. At its intersection with US 13, US 13 is a divided highway, with restaurants located in the median. The access points to these restaurants may create conflicts with bicycle traffic. Where the route crosses US 113, there are

higher volumes of traffic which may deter less experienced cyclists. The interchange at SR1 may also require improvements to reduce conflicts between bicycles and traffic utilizing the ramps at this interchange.

Other minor though potentially more complicated intersections occur within Milford where traffic is more concentrated. In implementing this route it is critical that provisions be made to maximize safety at these intersections including placement of stop bars, striping, signage and other relevant measures.

**Traffic.** Along rural portions of this route, traffic volumes are low. Although traffic speeds in rural areas are generally higher than in urban areas, the lower traffic volumes offset this issue. Automobiles can comfortably pass cyclists by crossing into the opposing travel lane. Traffic volumes increase, however, in Milford and Harrington. Access driveways and on street parking contribute to potential conflicts between motorists and bicycles. Both drivers and cyclists need to be extra careful to ensure that conflicts between automobile and bikes are minimized.

**Railroad crossings.** The bicycle route crosses the Norfolk Southern mainline railroad tracks in Dover. The crossing is at grade and at a 90-degree angle. It does not pose a problem for bicycle travel.

### **Opportunities for Connections**

- Destinations and Activity Centers:
  - Haven Lake
  - Cedar Beach
  - Milford Neck Wildlife Area
  - Slaughter Beach
  - Direct connection between the cities of Milford and Harrington.
- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Delmar to Felton (Bicycle Route 3)
  - Wilmington to Selbyville (Bicycle Route 2)

### **Land Use Considerations**

The MD Border to Slaughter Beach bike route passes through a variety of land uses including urbanized areas in Milford and Harrington and environmentally sensitive wetlands in Prime Hook and along the Delaware Bay. While Milford and Harrington exhibit the greatest potential for bicycle travel, they are also the most difficult to improve due to physical and operational constraints. Key improvements such as signage and striping will be important steps in implementing this bike route.

Delaware's Department of Planning has formulated policies for investment levels as part of its *Strategies for State Policies and Spending* study. According to these policies, the more densely developed an area, the higher its priority for spending on alternative

transportation modes. The land around Milford is categorized as Investment Levels 1 and 2 by these policies, the levels allocated to the most densely developed urbanized areas and suburban areas respectively. While the communities connected through this routing are not heavily populated, they route offers important regional connections and as such should be given consideration in the programming process.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.



## Sussex County







## **BICYCLE ROUTE 1 - SUSSEX COUNTY**



**Figure B.29. Bicycle Route One - SR 1 south of Dewey Beach**

### **Route Overview**

The 50 mile portion of this Statewide Bicycle Route within Sussex County provides access from the northern portions of the state at Kent County to the towns in eastern Sussex and the resort communities along the Atlantic Ocean.

### **Description of Route**

Bicycle Route 1 improves north-south bicycle mobility. Within Sussex County, the route improves bicycle mobility to the resort areas along the Atlantic Ocean, as well as providing connectivity between the beach and the northern cities of the state.

Bicycle Route 1 continues from Kent County at Abbots Pond Road (S 620). From there the route continues south on Union Church Road (S 36), east on Rust Road (S 635), Calhoun Rd (S 621) and Fitzgerald's Road (S 207), which becomes Johnson Road east of DuPont Boulevard (US 113). Bicycle Route 1 continues east along Johnson Road (S 207) and northeast along Wilkens Road (S 206) where it connects with SR 30 (Cedar Creek Road – S 212) and continues south. The route follows SR 30 and Cedar Creek Road (S 212) to the Union Street Extension (SR 5/S 22) as it heads south through the Town of Milton.

From Milton, the bicycle route continues southeast on Front Street (S 89) to Cave Neck Road (S 88), south on Dairy Farm Road (S 261), and southeast on Sweet Briar Road (S 261). The route then turns northeast on Beaver Dam Road (SR 23/ S 285) to Five Points, where SR 23 becomes SR 1D/S 275. The route then turns south and at its intersection with John J. Williams Highway (SR 1D/SR 24); Beaver Dam Road becomes Warrington Road (S 275) and continues south to Old Landing Road (S 274). The route continues east on Old Landing Road and continues to SR 1 where the route continues to Rehoboth Beach, Dewey Beach, and Bethany Beach before reaching Fenwick Island and the Maryland border.

## Barriers and Opportunities

**Lane Widths/Road Geometry.** Conditions along the route are fairly uniform: flat, well-paved roads with shoulders on both sides. In areas without shoulders, traffic volumes are fairly low, and cycling conditions are good.

The most complex roadway issues are associated with SR 1 (See Figure B.30.) Although there are bicycle lanes marked along the southern section, the higher volumes of traffic—especially during the tourist season—may deter less experienced bicyclists. The number of access points to businesses and subdivisions along SR 1 in developed beach areas also increases the potential for bicycle accidents. As this portion of the route is frequented by tourists, it may be appropriate to implement special signage and education programs to alert visitors to the presence of bicyclists.



**Figure B.30. SR 1 at SR 54, facing north.**

In downtown Milton, on-street parking is present and there are no shoulders. This may increase the potential for bicycling accidents.

**Major intersections.** Bicycle Route 1 was originally designed to avoid as many major roadways as possible to provide a more recreational experience for cyclists; as such, the number of major intersections along the route has been minimized. Along SR 1, Bicycle Route 1 crosses SR 54, SR 25, and SR 24. Each of these intersections is signalized; however, the high volumes of traffic and complexity of turning movements may deter less experienced cyclists.

The intersection of US 9 and SR 1 is a high-volume intersection. Although signalized, the complex geometry of this intersection may cause confusion, and bicycle traffic may not be expected by automobiles using this intersection.

Bicycle Route 1 crosses DuPont Highway (US Route 113) at Johnson Road. This intersection is signalized; allowing cyclists to safely maneuver through here.

**Water crossings.** There are three major water crossings along this portion of Bicycle Route 1. The first is at the Indian River Inlet north of Bethany. This bridge has no shoulders for bicycle travel and is along a section with very high traffic speeds. It can pose a problem for all but the most advanced rider.

The second is along SR 1 at the Lewes and Rehoboth Canal. This is a four-lane bridge with separate spans for northbound and southbound traffic. While there are wide shoulders on this bridge, its length, high volumes of traffic, turning vehicles, and the higher speeds of travel add to the difficulty bicyclists' face attempting to cross the Canal.

The third crossing is at the Broadkill River in Milton. This is a short, two-lane crossing with shoulders which should not pose a major barrier to bicycle travel.

**Railroad crossings.** There are three railroad crossings along this portion of Bicycle Route 1: along US 9 with the Delaware Coast Line Railroad, along SR 5 with the DelDOT/Delaware Coast Line Railroad, and along Johnson Avenue with the Norfolk Southern Railroad. These are all at-grade crossings.

### **Opportunities for Connections**

- Activity Centers:
  - Milton, DE
  - Rehoboth Beach
  - Dewey Beach
  - Bethany Beach
  - South Bethany
  - Fenwick Island
- Statewide and other Long Distance Trails
  - American Discovery Trail, a US long-distance hiker-biker trail providing access to Maryland and points west.
  - Wilmington to Selbyville - Statewide Bicycle Route 2
  - Maryland Bicycle Route along MD 528
  - Maryland Bicycle Route along MD 54
- Regional Bicycle Routes:
  - MD Border to Slaughter Beach (K-6)
  - Greenwood to Broadkill Beach (S-1)
  - Milton to Rehoboth Bay (S-3)
  - Laurel to Lewes (S-6)
  - US 13/SR30 to Fenwick Island (S-9)

- Recreational and Other Trails:
  - Junction Breakwater Trail located on the west side of SR1 could provide additional linkages to Rehoboth and Lewes

### **Land Use Considerations**

The portion of the route southeast of Maintenance Road 264 falls within an area designated as an Environmentally Sensitive Development Area by the Delaware Department of Development *Strategies for State Policies and Spending (State Strategies)*. The addition of new transportation facilities in such areas may not be appropriate; however it should be possible to accommodate bicycle facilities on the existing roadways.

The resort areas along SR 1 are generally classified as Investment Levels 1 and 2. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling), while investments in Level 2 are considered less of a priority.

The majority of the route west of the Environmentally Sensitive Development area is classified as Investment Level 4. Such areas protected from development as specified by the *State Strategies*. Although these areas typically receive the lowest priority for investments, the connections this route provides between the shore and the rest of the state may increase its attractiveness for bicycle facility investments.

The route crosses through Investment Levels 1, 2 and 3 as it passes through Milton and crosses through Investment Level 3 as it passes the southern outskirts of Milford. While transportation investments in Levels 2 and 3 are considered less of a priority under the *State Strategies* than investments in Level 1 areas, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

### **Recommendations**

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.

## **BICYCLE ROUTE 2 - SUSSEX COUNTY**

### **Wilmington-Selbyville**



**Figure B.31. Intersection of SR 26 at SR 113**

#### **Route Overview**

This 39-mile portion of the Wilmington-Selbyville Statewide Bicycle Route provides for bicycling in the US 113 corridor, providing a key north-south link in the bicycle network. The route provides access from Kent County and parts north to municipalities in the center of Sussex County and the southern portion of the Delmarva Peninsula.

#### **Description of Route**

This route begins in Sussex County on Walnut Street. Walnut Street continues south through Milford and becomes Wiltjen Road/Old State Road (S 213) south of the city limits. The route continues south on Old State Road (S 213) through Ellendale and then turns east on Robbins Road (S 579), southeast on Saw Mill Road (S 238), south on Pine Road (S 239), and then east on Redden Road East (S 565). The route follows the eastern edge of the Ellendale/Redden State Forest while heading south on Downs Road (S 243), which becomes Donovans Road (S 243) just past the forest. The route continues south on Donovans Road (S 243) and intersects with Bedford Street (S 431), just north of Georgetown. The route follows Bedford Street (S 431) south through Georgetown.

On the outskirts of Georgetown, Bedford Street (S 431) becomes Zoar Road (S 48) and then continues southeast on Bethesda Road (S 326). Near Bark Pond, the route turns west and then south and becomes Betts Pond Road (S 326). The route then travels east along SR 20 (Thompsonville Road), and then heads south on Hickory Hill Road (S 82). The route then heads southeast on Handy Rd. (S 82). Handy Road joins SR 20 at its intersection with Dagsboro Road (S 334). The route continues south along Dagsboro Road, which becomes Main Street (S 401) at a Y-intersection with Iron Branch Road (S 331), as it enters and travels through the town of Dagsboro. The route continues south on Main Street (S 401) as it becomes Clayton Avenue. From Clayton Avenue (S401), the route turns east on Main Street/Pepper Road (S 376) in the town of Frankford. The route

continues south on Pepper Road (S 376) through Selbyville. In Selbyville, Pepper Road (S 376) becomes Main Street (S 398), and continues south to the Maryland State Lines, which is the terminus of this route.

### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** The vast majority of the route consists of two-lane rural roadways. Those sections of the route in and around Selbyville, Dagsboro, Millsboro, and Georgetown have shoulders suitable for bicycling; however, the majority of the route does not have shoulders. This is offset somewhat by the lower traffic volumes on these rural stretches.

Within the municipalities, the roads followed by the route have on-street parking, which may create conflicts with automobiles. In Georgetown, the route goes through the Circle, a roundabout in the center of town (see Figure B.32) where angled, on-street parking constitutes a potential hazard for cyclists.



**Figure B.32. The Circle in Georgetown, facing northwest.**

**Major intersections.** The two major intersections along this route are both with US 113, to the north and south of Millsboro. Both are signalized; however, the volumes and speed of traffic at these locations may deter less experienced cyclists.

**Water crossings.** There is no major water crossings associated with this portion of the route.

**Railroad crossings.** The route crosses the Norfolk Southern Railroad in four places in Sussex County: south of Milford, south of Ellendale, north of Millsboro, and north of Dagsboro. These are all at-grade crossings which should not pose a major barrier to bicycle travel.

## Opportunities for Connections

Major Destinations and Activity Centers: This statewide route links the central Delaware municipalities of Milford, Ellendale, Georgetown, Millsboro, Dagsboro, Frankford, and Selbyville.

- Statewide Bicycle Routes:
  - Bicycle Route 1
- Regional Bicycle Routes:
  - Laurel to Lewes (S-6)
  - Dagsboro to SR20/54 (S-8)
  - Milton to Millsboro (S-2)
  - Maryland Border to Bethany (S-7)
  - US 13/SR30 to Fenwick Island (S-9)
  - West Milton to Millsboro (S-2)
  - MD Bicycle Route on MD 54
- Recreational, local and other bicycle routes:
  - American Discovery Trail
  - Off-road trails within Redden State Forest and Ellendale State Forest.

## Land Use Considerations

The municipal areas traversed by this route are generally classified as Investment Levels 1 and 2 by the *Strategies for State Policies and Spending (State Strategies)*. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling), while investments in Level 2 are considered less of a priority. At the outskirts of the municipalities are smaller areas classified as Investment Area 3. While transportation investments in Level 3 are considered less of a priority under the *State Strategies* than investments in areas designated Level 1 and 2, the utility of providing statewide bicycle access may warrant the investment in bicycle facility improvements.

The majority of the route running outside of the municipalities lies in areas classified as Investment Level 4. Such areas protected from development as specified by the *State Strategies*. Although these areas typically receive the lowest priority for investments, the north-south connections this route provides may increase its attractiveness for bicycle facility investments.

## Recommendations

The facility recommendations proposed for Statewide Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Statewide Bicycle Routes.



## **ROUTE S-1**

### **Greenwood to Broadkill Beach**



**Figure B.33. State Route 16 in Ellendale**

#### **Route Overview**

The Greenwood to Broadkill Beach route (shown as Route S-1 on the Sussex County map) is a Regional Bicycle Route covering 21.7 miles from the intersection of US 13 and SR 16 just west of Greenwood to Broadkill Beach on the Delaware Bay.

#### **Description of Route**

This route provides east-west access and connectivity to some of central Sussex County's towns and surrounding developments and provides access to the growing community and existing recreational areas at Broadkill Beach and the Prime Hook National Wildlife Refuge.

The bicycle facility is located entirely on SR 16, a two-lane roadway with shoulders for almost the entire length of the route in areas of mostly low to moderate traffic. The route passes through Ellendale and Milton before reaching Broadkill Beach and crosses US113, SR30, SR5 and SR1 along its length. The route crosses the Norfolk-Southern rail line in Ellendale. Traffic volumes may be moderately heavy at times, particularly in peak summer tourist periods, and speeds can be fast (over 45 mph.)

#### **Barriers and Issues**

**Lane Widths/Road Geometry.** The route is along SR16 which has shoulders along both sides of the roadway for much of its entire length. However, within Prime Hook National Wildlife Refuge, the shoulders disappear and there are guard rails immediately next to the edge of the pavement.

Within the town of Ellendale there is on-street parking on both sides of the roadway that may pose an issue for some cyclists. However the traffic speeds, which are heavily enforced, are low so potential conflicts would probably be minimized. In the town of Milton SR 16 travels through a developing area of the

town but bypasses the downtown area. Some turning movements may be of a particular issue to cyclists but the state has begun accommodating bicyclists with a dedicated lane in this area. Further development should lead to a more integrated bike facility network in this area.

**Traffic.** The roadway is a typical rural two lane highway in most places with accompanying high traffic speeds (more than 45 mph). Traffic volumes in peak summer travel periods can be higher. In Ellendale, on-street parking and standard lane widths limit the opportunities for sharing the roadway.

**Major intersections.** The major intersections along the route include SR16 / US13, SR16 / US113 and SR16 / SR1. In each of these areas the accommodation of automobile turning movements and limited lane widths make traveling by bicycle a particular challenge. At the intersection of US13 and SR16, there are businesses within the median between the north-and-southbound lanes (see Figure B.34). Turning movements made to access these businesses conflict with bicycles traveling along the route.

**Water Crossings.** The only significant water crossing along this route is over the Broadkill Sound. The roadway in this area has sufficient shoulders for bicycle travel.



**Figure B.34. Bridge into Broadkill Beach**

**Railroad crossings.** The bicycle route has an at-grade crossing over the Norfolk Southern railway in Ellendale. The crossing is at a 90-degree angle which is preferable for bicyclists however the rail bed in this area is wood which may be an issue for most cyclists.

## **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington to Selbyville (Bicycle Route 2)
  - Delmar to Felton (Bicycle Route 3)
- Regional Bicycle Routes
  - West Milton to Millsboro (S-2)
- Recreational Connectors, local and other bicycle routes:
  - East of Greenwood
  - Near Milton
- Major Highways:
  - US 13
  - US 113
  - SR 1
  - SR 30
  - SR 5

## **Land Use Considerations**

A variety of land use conditions exist along the 21 mile route, including rural farms, sparsely developed areas, areas of discontinuous suburban style development, and more urbanized density. The most densely developed areas with the most propensities for bicycle travel are in the areas near Greenwood, Ellendale and Milton where SR16 serves as the main route between the town areas and the surrounding development.

The four land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 4, 3, 2, and 1 respectively of the *Strategies for State Policies and Spending*. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities.

## **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## ROUTE S-2

### West Milton to Millsboro



**Figure B.35. Milton Central Business District**

#### Route Overview

The West Milton to Millsboro Route (shown as Route S-2 on the Sussex County map) is a 26-mile Regional Bicycle Route. The route begins at the intersection of SR 30 and SR 16 west of Milton and travels along SR 30 to SR 26, just southwest of Dagsboro.

#### Description of Route

SR 16 connects with Bicycle Route 1 just east of where SR16 intersects with SR 30 and provides a direct connection between the communities of Milton and Millsboro. Most of the route takes place in a rural setting on two-lane roads with ample ten-foot shoulders.

#### Barriers and Opportunities

**Lane widths/Road geometry.** As the route enters Milton (see Figure B.35) the increased traffic volumes and parked cars limit the space available for bicycle travel.

**Traffic.** Within the Millsboro central business district, traffic volumes increase. There are also a large number of access points to businesses which could create conflicts between turning cars and through bicyclists.

**Major intersections.** The bicycle route intersects with numerous county roads, but only a few major state routes. These include SR 404, SR 9, SR 24 at the southern edge of the Millsboro central business district, and SR 20 towards Dagsboro.

Additionally, SR 30 intersects with US 113/SR 20, at the southern edge of downtown Millsboro. The intersections of SR 30 with SR 24 and US 113/SR 20 present hazardous conditions for bicyclists because of high traffic volumes, auto-oriented businesses, and turning movements in the area. The marked shoulders also disappear, although the lanes are wide.

**Water Crossings.** There are a number of water crossings on this route. The most significant water crossing occurs at the Indian River along SR 30 just before entering Millsboro. The bridge has no designated bicycle facility or right-of-way. There are drainage grates in the path of cyclists that must be avoided. Additionally, the bridge has a right-turn lane on the northbound side.

Other water crossings include the Pemberton Branch along SR 30 just past the intersection with SR 16; Ingram Branch soon after Pemberton; Round Pole, just before where SR30 intersects with US 9/SR 404; Iron Branch and Whartons Branch, just past the intersection with SR 20; and the northern branch of Pepper Creek, just north of the route's end point. The roads supporting these crossings were not identified as having any significant barriers, but a more in-depth review may be necessary.

**Railroad crossings.** As the route enters Millsboro, there is an at-grade crossing of the Norfolk Southern rail line. The angle is 90 degrees, which is typically compatible with safe cycle crossing.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Wilmington-Selbyville Route 2
- Regional Bicycle Routes:
  - Greenwood to Broadkill Beach (Route S-1)
  - MD Border to Millsboro via Seaford and Blades (Route S-5)
- Unnamed Recreational Connectors
- Major Highways:
  - SR 30
  - SR 5
  - US 9/SR 404
  - SR 24
  - US 113/SR 20

### **Land Use Considerations**

Land uses are predominantly rural along the route, particularly between Milton and Millsboro. Both of these communities have densely developed mixed use downtowns that are surrounded by less densely developed, discontinuous residential and commercial areas.

Milton has an active historic district which offers the potential for a recreational connection by bicycle, particularly with the proximity to a circle of popular fishing and boating ponds: Loving Pond, Waggamons Pond, and Diamond Pond. These ponds are easily accessed by SR30 and the bicycle route. Millsboro also has the local connection to the Indian River, Millsboro Pond and Betts Pond.

The majority of the route falls within areas designated as Investment Level 4, areas protected from development as specified by the *Strategies for State Policies and Spending*. Although these areas typically receive the lowest priority for investments, the connections this route provides within Sussex County may increase its attractiveness for bicycle facility investments.

The portions of the route west of Milton and going through Millsboro are classified as Investment Levels 1 (in the center of Millsboro), 2, and 3. Level 1 areas are considered the most appropriate areas in which to target investments in alternative modes of transportation (i.e. bicycling.) While investments in Level 2 and Level 3 areas are considered less of a priority than Level 1 areas, the utility of connecting this regional route to others in the bicycle network may warrant the investment in bicycle facility improvements.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## ROUTE S-3

### Milton to Rehoboth Bay



**Figure B.36. SR 5 in Milton, facing north**

#### Route Overview

This 18-mile route (as shown as Route S-3 on the Sussex County map) branches southward from Bicycle Route 1 in Milton along SR 5 and SR 23 to Massey Landing at Rehoboth Bay. The route largely follows two-lane major highways through largely rural and small town municipal areas.

#### Description of Route

This route provides a direct connection to central portions of Rehoboth Bay from the Town of Milton. The route provides alternative to Bicycle Route 1 for accessing Rehoboth Bay. The route provides access to marine supply stores and other small retail, but overall the route has little development.

#### Barriers and Issues

Few barriers characterize this bicycle route, particularly for experienced riders.

**Lane widths/Road geometry.** For the most part, this route is serviced by two-lane roads with wide shoulders. The exception to that is in the Town of Milton where SR 23 has 14-foot wide lanes and no shoulders.

**Major intersections.** The intersection of SR5 with SR 9 is the largest intersection on the route. No major issues were identified with this intersection. Other intersections along the route include the intersection of SR 5 with SR 23, and the intersection of SR 23 and SR 24.

**Traffic.** Traffic volumes were not observed to be very high. Traffic volume data should be examined for seasonal variations or growth trends to ensure traffic does not pose any issues for bicyclists.

**Water Crossings.** SR 5 crosses the Round Pole Branch just south of Milton, the Beaverdam Creek, Bundick's Branch, Chapel Branch, Unity Branch, and Guinea Creek on its way towards Massey Landing. The shoulders and traffic volumes along these crossings were not observed to pose a significant barrier to bicycle travel.

**Railroad crossings.** The route has an at-grade crossing of the Delaware Coast Line Railroad. This is a 90-degree angle crossing, which is typically considered compatible with safe bicycle crossing.

### **Opportunities for Connections**

- Statewide Bicycle Route:
  - Bicycle Route 1
- Regional Bicycle Routes:
  - Laurel to Lewes (S-6)
  - SR16/US 13 to Broadkill Beach (S-1)
  - MD Border to SR-1 via Seaford and Millsboro (S-5)

### **Land Use Considerations**

The areas around Milton are the most densely developed of the route. They are characterized by small concentrations of mixed residential and small retail. A mix of Investment Levels 1, 2, and 3 can be found in these areas, as defined by the *Strategies for State Policies and Spending*. Investment Level 1 pertains to the most densely developed areas of the state and are the areas which received the highest priority for spending related to bicycle travel and other alternative transportation modes. Investment Level 2 areas contain less dense development and Investment Level 3 is rural in character with sparse development. The remainder of the route is largely undeveloped and protected land, those found in Investment Level 4.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.



## ROUTE S-4

### MD Border to Georgetown



**Figure B.37. Route 18 through Bridgeville**

#### Route Overview

This Regional Bicycle Route (shown as S-4 on the Sussex County map) covers 19.9 miles from the Maryland border in western Sussex County along SR18 to Bridgeville and then along Route 404 into Georgetown.

#### Description of Route

This route provides access to Maryland's Eastern Shore and to the towns of Bridgeville and Georgetown along two developing corridors. It also provides access between Statewide Bicycle Routes 2 and 3, the Wilmington-Selbyville and Delmar-Felton statewide bicycle routes.

The route begins at the Maryland border along SR18, a two-lane road with shoulders on both sides. The route continues along SR18 through Bridgeville and turns southeast along SR404, another two-lane road with shoulders. The route follows SR404 into Georgetown, where it connects to Statewide Bicycle Route 2 along Bedford Street.

#### Barriers and Opportunities

**Lane Widths/Road Geometry.** Most of the bicycle route features shoulders of varying widths to service bicycle traffic. Through Bridgeville, SR18 has marked, on-street parking in the eastbound direction and no shoulder along the westbound lane. From SR18 to the southern edge of Bridgeville, SR404 is a two-lane road. There are no shoulders along this stretch of SR404; however, the lanes are wide enough to accommodate both automobile and bicycle traffic.

Within the Town of Bridgeville, the roadway is typical of that found in rural urban areas. Limited roadway width and on-street parking may pose an obstacle for the novice rider.



**Figure B.38. Route 404 / US 13 Intersection**

**Major intersections.** The primary travel barriers for bicyclists on this route are the intersections at US13 and US113. Wide roadway crossings, dedicated automobile turning lanes, and lack of dedicated areas for bicycling or adequate lane widths for shared use combine to make these intersections particularly challenging. Figure B.38 denotes the conditions at the intersection of SR404 and US13.

**Traffic.** The roads on this bicycle route are major state highways two lanes in width with high traffic speeds. SR404 can carry very high volumes of traffic traveling at high speeds in the peak summer months.

**Water Crossings.** In the area near the Nanticoke River the shoulder narrows possibly due to the presence of wetlands. However the shoulder is adequate for bicycle travel through this area.

**Railroad crossings.** The bicycle route crosses over the Norfolk Southern railway in downtown Bridgeville. Shoulders are present on the north side (westbound) of this crossing but are not available on the south side (eastbound) of this crossing. The railway crosses the street at an angle which can pose some problems for the novice cyclists. Concrete bedding and low traffic speeds in this area make this crossing less difficult.

### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Wilmington-Selbyville, Statewide Route 2

- Delmar-Felton, Statewide Route 3
- Regional Bicycle Routes:
  - Laurel to Lewes, Bicycle Route S-6
- Major Highways:
  - US 13
  - US 113
  - Route 404
  - SR 18

### **Land Use Considerations**

A variety of land uses exist along the 19-mile route, including rural and sparsely developed areas, areas of discontinuous suburban style development, and areas with a more urbanized density. The most densely developed areas with the highest propensity for bicycle travel are in the areas near Bridgeville and Georgetown.

The three land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 3, 2, and 1 respectively of the *Living Delaware Strategies for State Policies and Spending (State Strategies)*. According to the *State Strategies*, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities. Investment Level 3 is designated for largely rural areas and is the lowest priority area for investments in bicycle facilities. Investment Levels 2 and 1 are for suburban and urban areas respectively and are given higher priority consideration for such investments.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE S-5**

### **MD Border to SR1 via Seaford and Millsboro**



**Figure B.39. SR 20 crossing the Norfolk Southern Railroad, eastbound**

#### **Route Overview**

The 37-mile route provides east-west access and provides connectivity from the Sussex County town of Seaford to Millsboro and the resort communities of Lewes and Rehoboth Beach.

The bicycle route operates entirely on existing roadways with mixed traffic. However portions of the route are striped and signed for bicycle use. Due to the length of this route – nearly 37 miles – it traverses a wide variety of land use ranging from developed stretches of commercial development to rural highway.

#### **Description of Route**

This Regional Route (shown as Route S-5 on the Sussex County map) covers 53 miles from the MD border to where SR1 meets SR24. The route begins at SR20 at the Maryland border following SR20 to Market Street (S13) in Seaford. The route turns south on Market Street (S13) to Blades where it reconnects to SR20. The bike route then follows SR20 for more than 20 miles until it intersects with US113/SR24/SR30 in Millsboro. The route continues on SR24/SR30 until it connects to SR1 near the resort area commercial areas.

#### **Barriers and Issues**

**Lane Widths/Road Geometry.** The majority of the route consists of two-lane roads with shoulder widths sufficient for bicycle facilities. Within Seaford, SR20 expands to five lanes. The traffic volumes on this road may deter less experienced cyclists. The majority of the route within Seaford and Blades uses roads with on-street parking, which may create conflicts with bicycle traffic.

As the route approaches SR1, SR24 widens to six lanes. In this section, there are multiple access points to big-box retail stores, which may create conflicts for bicyclists.

**Major intersections.** Three intersections should be noted for potential conflicts with automobile traffic:

- SR 20 and US 13 – A slight turn on the westbound approach may affect the line-of-sight at this intersection.
- SR20 and US 113 – This intersection is signalized with heavy traffic. A typical section of this stretch of roadway is four lanes with a center median.
- SR24 and SR1 – This intersection is part of a stretch of roadway that makes up the widest portion of the bike route. With six traffic lanes the route exhibits heavy traffic and is lined with big box retailers and automobile friendly development.

**Traffic.** Over the nearly 37 miles of roadway covered by this proposed bike route traffic levels vary significantly. Traffic in some areas is rural in nature while other locations have moderate traffic volumes. Traffic is highest in the communities of Seaford, Blades and Millsboro and near the intersection with SR1. For the majority of rural roads included in this route, automobiles can comfortably pass cyclists by crossing into the opposing traffic's lane and although traffic speeds in rural areas are somewhat higher, lower traffic volumes mitigate this factor.

**Water Crossings.** There are four water crossings along this route. Between Seaford and Blades, the route crosses the Nanticoke River at a drawbridge (see Figure B.40). It may be difficult to improve the travel way for bicycles on the bridge itself – signing and striping should be used to notify both the motorist and the bicyclist of the need to share the limited road space. The three remaining water crossings along this route occur at the Indian River in Millsboro, Trap Pond, and Love Creek. The bridges at each of these crossings have sufficient shoulders for bicycles.

**Railroad crossings.** This route passes over the Norfolk and Southern Railroad in Seaford (see Figure B.41). This is a four-lane overpass with sidewalks and a small shoulder. The line of sight on this bridge is limited and traffic volumes are moderate.



**Figure B.40. Drawbridge between Seaford and Blades, facing north.**



**Figure B.41. SR 20 crossing over Norfolk Southern in Seaford, facing east.**

#### **Opportunities for Connections**

- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Wilmington-Selbyville, Bicycle Route 2
  - Delmar-Felton, Bicycle Route 3
- Regional Bicycle Routes:
  - Laurel to Lewes, Route S-6

- West Milton to Millsboro, Route S-2

The proposed bike route passes through three developed communities: Seaford, Blades, and Millsboro. The terminus of the bicycle route is the State Route 1 corridor in the resort area. The resort area offers many commercial and recreational opportunities and is a fairly significant bicycle trip generator. In addition, DTC buses serving this area are equipped with bike racks so that trips can be easily extended to other parts of the DTC service area.

### **Land Use Considerations**

The 37 mile long bike route traverses a variety of land uses from urban to rural. Much of the route is bordered by fields or low density housing. However, in the urban communities of Seaford, Blades, and Millsboro there are greater densities of development. The eastern terminus of the proposed route is at the State Route 1 Resort area corridor which consists of several “big box” retail establishments. .

Delaware’s Department of Planning has formulated policies for investment levels as part of its *Strategies for State Policies and Spending* study. According to these policies, the more densely developed an area, the higher its priority for spending on alternative transportation modes. The municipalities traversed by this route fall into those categories with the highest densities, Investment Levels 1 and 2. East of Millsboro the route lies within areas designated as Investment Levels 3 and 4. Investment Level 3 is considered to be an area where development and investment should be limited. Areas designated as Investment Level 4 are protected, limiting the amount of development which can occur here.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with design guidelines for Regional Bicycle Routes.

## ROUTE S-6

### Laurel to Lewes



**Figure B.42. US 9/US 13, facing west**

#### Route Overview

This 28.2 mile Regional Bicycle Route (shown as Route S-6 on the Sussex County map) travels northeast along US9 from Laurel to Lewes and the Delaware terminal of the Cape May-Lewes Ferry.

#### Description of Route

This Regional Bicycle Route provides access from the inland communities of Laurel and Georgetown to Lewes and the Lewes to Cape May Ferry. This ferry provides access to patrons coming by car, bicycle, or as pedestrians. Linkages are also made to regional bike routes using intersecting state routes 20 and 404 as well as three Statewide Bicycle Routes.

#### Barriers and Opportunities

**Lane widths/Road geometry.** For the most part, this route runs along 2-lane roads with a wide shoulder in places or with wide outer travel lanes (14 ft.) permitting comfortable bicycle travel.

As SR9 enters the developed areas of Georgetown, the availability of wide shoulders or outer lanes is more sporadic. This is complicated by increased traffic volumes, complex turning movements at major intersections, and curb cuts for business access. Additionally, there is a traffic circle in Georgetown with parking along the outer edge, a hazardous condition for cyclists using the circle.

In the area of Lewes east of the Lewes and Rehoboth Canal, the route is on roadways with shoulders sufficient for bicycle travel. West of the canal, the roadways within town are typical of those in municipal areas, with on-street parking on both sides of the street.



**Traffic.** Traffic volumes vary throughout the entire 28-mile route, increasing in and near the municipalities of Lewes and Georgetown. The area around Lewes and near the SR1 corridor is subject to increased traffic during the tourist season.

**Major intersections.** There are three intersections which need to be examined for their accommodation of bicyclists. The most complex of these is the five-way intersection of SR 9/404 with SR 23 and SR 1 (see Figure B.43.) This is a high-traffic location with multiple turning movements.



**Figure B.43. Intersection of US9/404, SR23, and SR1, facing northeast.**

The other two major intersections are at US13, and US113. These two intersections are characterized by typical suburban design with auto-oriented businesses with curb cuts at each corner, complicating the travel movements of cyclists approaching the intersection. Turning vehicles may pose a hazard.

**Water Crossings.** This route contains two water crossings, one across Broad Creek (see Figure B.44) on SR9 near Laurel and the other in Lewes across the Lewes and Rehoboth Canal. Each uses a drawbridge with no shoulders or designated travel way for bicyclists, although both contain sidewalks which dismounted bicyclists may use.



**Figure B.44. Broad Creek Bridge, Laurel Delaware**

**Railroad crossings.** At-grade railroad crossings are both numerous and at dangerous angles for cyclists on this route. Crossings of the Delaware Coast Line Railroad occur on both Business Route 9 and US 9. These crossings are at an angle of less than 45 degrees. Warning signs for cyclists are posted on the crossing on BR9, but not on US 9. The US 9 rail crossing is particularly dangerous in that it cuts across the shoulder and travel lanes without a barrier or sign.

### **Opportunities for Connections**

- Municipalities:
  - Laurel
  - Georgetown
  - Lewes
- Intermodal connectivity:
  - Lewes Ferry to Cape May, New Jersey
- Statewide Bicycle Routes:
  - Bicycle Route 1
  - Delmar to Felton, Statewide Bicycle Route 3
  - Wilmington to Selbyville, Statewide Bicycle Route 2
- Major highways:
  - US 13
  - US 113
  - SR20
  - SR30

- SR5
- SR23
- US 1

### **Land Use Considerations**

Land uses vary considerably throughout the bicycle route. The three urbanized areas of Laurel, Georgetown and Lewes contain a mix of dense mixed-use areas, less dense and sporadic development consistent with many suburban and rural areas. Situated between the urbanized areas are many undeveloped and protected lands.

The land use conditions noted above are designated by the Delaware Department of Planning as Investment Strategy Levels 1, 2, 3, and 4 respectively of the *Strategies for State Policies and Spending*. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities. Investment Level 1 is applied to the most urbanized areas of the State and is a priority area for spending on alternatives to automobile travel. Investment Levels 2 and 3 pertain to areas of lower density suburban and rural development, and have a lower priority than Investment Level 1 for investments to infrastructure to support non-automobile travel. Investment Level 4 areas are targeted as protected lands and for which little to no infrastructure development is typically recommended.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## **ROUTE S-7**

### **Maryland Border to Bethany Beach**



**Figure B.45. SR 24 in Laurel, facing east**

#### **Route Overview**

This 37-mile Regional Bicycle Route (shown as Route S-7 on the Sussex County map) travels east from the Maryland border at SR24 to Bethany Beach via SR26. The route is scenic and primarily rural, passing through several small towns, including Laurel, Dagsboro, Millville, and Ocean View before terminating at Bethany Beach. The roads that make up this route are primarily two-to-four lane principal highways with low to moderate traffic volumes.

#### **Route Purpose/Rationale**

The purpose of the route is to provide a continuous east-west bicycle route through southern Sussex County, connecting the towns of Laurel, Dagsboro, Millville, Ocean View, and Bethany Beach. It may be expected that this route will serve visitors wishing to access the beach areas from the central and western portions of the state, as well as from the State of Maryland.

#### **Description of Route**

Lower traffic volumes and generally flat terrain create favorable conditions for bicycle travel to and between the towns along the route. Additionally, sections of the route are characterized by scenic stretches of rural and wooded lands which may attract recreational trips as well as utilitarian trips. Several stretches of the road have shoulders that are at least 4 feet in width or have a 14 foot outside travel lane. The last ten miles of the route approaching Bethany Beach have high traffic volumes. However a 1.5 mile marked bike lane in this area provides a designated space for bicyclists in this area.

## Barriers and Issues

There are no major barriers along this route; however, there are some areas and locations which may require special consideration:

**Lane Widths/Road Geometry.** There are a number of small developed municipal areas along the corridor where on-street parking, heavier traffic volumes, busy intersections, and reduced lane widths may discourage bicycling. For example, in Laurel there is on-street parking along SR24 which compounds the safety issues associated with developed areas (reduced widths, higher volumes, turning movements). In the communities of Millville and Ocean View there are multiple curb cuts and traffic accessing businesses which may affect bicycling comfort.

**Major intersections.** The signalized intersection of US13 and SR24 is very busy with high traffic volumes – a condition that can cause discomfort for less experienced riders.

**Water crossings.** The only major water crossing along this route is at the Assawoman Canal in Bethany Beach. The bridge at this crossing has sufficient shoulder width to accommodate bicyclists and should not pose a barrier to bicycle travel.

**Railroad crossings.** There are two at-grade railroad crossings along this route: one near Laurel at the Norfolk Southern line and one in Dagsboro at the Maryland and Delaware railroad line.

## Opportunities for Connections

- Statewide Bicycle Routes:
  - Felton to Delmar, Statewide Bicycle Route 3
  - Wilmington-Selbyville, Statewide Bicycle Route 2
  - Bicycle Route 1
- Major Highways:
  - US 9 towards Cape Henlopen
  - Route 24 to Dewey and Rehoboth

## Land Use Considerations

This route travels through a mix of rural farms and small communities. The route provides opportunities for connecting these communities and providing access from them to the major destination of Bethany Beach.

The route falls within several Investment Area Level categories, as defined by *State Strategies for Policies and Spending*, developed by the Delaware Department of Planning. The municipal areas, such as the communities of Laurel and Bethany Beach are Investment Level 1, which are targeted for multimodal transportation investments such as bicycle and pedestrian investments. Between these more densely developed areas is land use that is predominantly rural in character with some lower density development

and small towns and villages. They fall into Investment Levels 2 and 3, which typically are not targeted for bicycle investments because of the distance between destinations.

### **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.

## ROUTE S-8

### Dagsboro to SR20/SR54



**Figure B.46. Intersection of State Routes 20 and 54**

#### Route Overview

The Dagsboro to SR 20/SR 54 route (shown as Route S-8 on the Sussex County map) is a Regional Bicycle Route covering approximately 9 miles in southeastern Sussex County. The route begins at the intersection of SR 20 and SR 26 in Dagsboro and travels along SR 20 to its intersection with SR 54 just west of Fenwick Island and north of the Maryland State Line.

#### Description of Route

This route provides a direct connection between Dagsboro and Fenwick Island. The bicycle facility is located entirely on SR 20, which is a two-lane roadway with fairly low traffic volumes. It provides access to SR 26 (Vines Creek Road), SR 54 (Lighthouse Road), SR 17 (Roxana Road) and a number of other Recreational Bicycle Routes in southeastern Sussex County.

#### Barriers and Issues

**Lane Widths/Road Geometry.** Most of the route features shoulders between 6 and 10 feet in width, which is adequate for bicycle travel. However, it should be noted that the shoulder consists of gravel in some sections.

**Major intersections.** The two intersections that serve as the termini for this route, SR20/SR26 and SR54/SR20, are typical roadways intersections which can be easily navigated by both automobiles and bicyclists. However, limited roadway pavement, the presence of multiple turn lanes, and high seasonal traffic can create difficult bicycling conditions, particularly for less experienced riders.

## **Opportunities for Connections**

- Statewide Bicycle Route:
  - Wilmington-Selbyville-Bicycle Route 2
- Regional Bicycle Routes:
  - MD Border to Bethany Beach (Route S-9)
  - US13/SR30 to SR54 Fenwick Island (Route S-7)
- Recreational Connectors:
  - Throughout the area

## **Land Use Considerations**

Mostly rural land use conditions exist along the majority of the 9-mile route. However, near Dagsboro typical suburban or urban commercial and residential development is present. Near Fenwick Island, commercial and recreational land uses become denser to support large seasonal populations.

The land use conditions noted above are designated by the Delaware Department of Planning as Investment Levels 3, 2 and 1 respectively of the *Strategies for State Policies and Spending (State Strategies)*. According to these policies, the more densely developed an area, the greater the priority for spending on alternative transportation modes such as bicycle facilities.

The southernmost portion of this route lies within an environmentally sensitive area, as designated by the *State Strategies*. Development and investment in such areas is discouraged, but the opportunity to improve travel conditions for alternatives to automobile travel may warrant the investment in bicycle facilities.

## **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.



## **ROUTE S-9**

### **SR 30/US 13 to Fenwick Island**



**Figure B.47. SR 54 in Cypress Swamp, facing east**

#### **Route Overview**

This 29.7 mile Regional Bicycle Route (shown as Route S-9 on the Sussex County map) follows an east-west path in the southernmost portion of Sussex County near the Maryland border. The proposed regional bike route links small communities such as Gumboro and Selbyville through a variety of natural environments such as the Cypress Swamp and the bay areas around Fenwick Island.

#### **Description of Route**

The US 13/SR 30 to Fenwick Island bike route begins at the intersection of US 13 and SR 30 following SR 30 until its intersection with SR 26/54 in Gumboro and continuing to Fenwick Island via SR 54/SR 1.

The bicycle route occurs entirely on existing roadways with mixed traffic. The portion of this proposed route from east of Keen-Wik on Bayville Road (S 588) to after the bridge to the east of the Little Assawoman Bay is currently signed and striped as an on-road bike route. The cycling environment over the length of this route benefits from the consistently level terrain of the area.

#### **Barriers and Opportunities**

**Lane Widths/Road Geometry.** The proposed bike route follows a typical two-lane rural roadway. The majority of the route has shoulders, with the exception of the segment of SR54 through Cypress Swamp. Here, the route does not have shoulders - possibly due to the sensitive natural environment that this route passes through (Cypress Swamp contains the northernmost stand of cypress trees in the United States) opportunities for expansion of the roadway to accommodate shoulders are limited in many locations (see Figure B.47.)

**Major intersections.** The bike route crosses three important intersections over its nearly 30-mile length: US13 and SR30, US113 and SR54, and SR1 and SR54. The western terminus of this route, US13/SR30, is unsignalized. Bicyclists traveling at low speeds must maneuver around cars traveling at high speeds along this corridor at this location. The intersection of US113 and SR54 just north of Selbyville is signalized, providing traffic control for bicycles and autos alike.



**Figure B.48. SR 54 and SR 1**

The intersection of SR 54 and SR1 handles the highest traffic volumes along this bicycle route (see Figure B.48.) This intersection is signalized and has dedicated turn lanes. Bicycle Route 1 is marked along SR1 at this intersection.

**Traffic.** Throughout the length of this route traffic volumes are low. Automobiles can comfortably pass cyclists by crossing into the opposing traffic lane in most instances. Although traffic speeds along this routing are somewhat higher due to its rural nature, lower traffic volumes mitigate this issue. Traffic volumes are highest in the most developed portions of the proposed route including Selbyville and areas closest to Fenwick Island. In portions of this route that are already a designated bike route, Share the Road signs are in place to heighten driver awareness of potential bicyclists.

**Water Crossings.** There are two water crossings of the Assawoman Bay along this route. The westernmost crossing has bicycle lanes along the bridge, as well as an off-road multi-use path that parallels the bridge. The easternmost crossing (just east of Jefferson Avenue) does not have shoulders, but has sidewalks.

**Railroad crossings.** The US13/SR30 to SR54 Fenwick Island bicycle route crosses the Maryland and Delaware railroad tracks in Selbyville. The crossing is a standard at grade crossing and as such does not pose a problem for bicycle travel.

## Opportunities for Connections

- Major Destinations and Activity Centers:
  - Cypress Swamp
  - Little Assawoman Bay
- Statewide Bicycle Routes:
  - Bicycle Routes 1,2,3
- Regional Bicycle Routes:
  - Dagsboro to Fenwick Island (S-8)
  - West Milton to Millsboro (S-2)
  - MD Bicycle Route on MD 54
  - MD Bicycle Route on MD 528 (Coastal Highway)

## Land Use Considerations

The proposed SR13/SR30 to SR54 Fenwick Island bike route is largely undeveloped or sparsely developed with the exception of Fenwick Island which incorporates a thriving summer tourism industry including hotel, restaurant and retail developments. The remainder of the route passes through a variety of natural environments from coastal to swamplands to forests.

While the communities connected through this routing are not heavily populated, the route provides connections for alternative transportation to neighboring communities which otherwise would have no alternative choices to automobile travel. In the case of Selbyville to Fenwick Island, the route offers seasonal workers a direct passage to employment opportunities on Fenwick Island.

Delaware's Department of Planning has formulated policies for investment levels as part of its *Strategies for State Policies and Spending (State Strategies)* study. According to these policies, the more densely developed an area, the higher its priority for spending on alternative transportation modes. Most of this route is categorized as Investment Level 4, lands protected from development because of the sensitive resources of which they are comprised. The communities of Fenwick Island and Selbyville fall into Investment Level 1 areas, the most "urbanized" category of lands in Delaware. Level 1 areas are recommended by the *State Strategies* for investments in alternative modes of transportation (i.e. bicycling.) The areas surrounding Fenwick Island and Selbyville are considered Level 2 and Level 3 areas, which have a lower priority for transportation investments.

The portion of the route east of Maintenance Road 389 is classified by the *State Strategies* as environmentally sensitive. This may limit the ability to introduce new transportation facilities; however, it may be possible to add bicycle facilities to the existing roadways.

## **Recommendations**

The facility recommendations proposed for Regional Bicycle Routes in Section 3.0 of this plan should be applied to this route as part of regular roadway construction and maintenance activities. Existing bicycle facilities along this route should be preserved or improved to be consistent with the design guidelines for Regional Bicycle Routes.